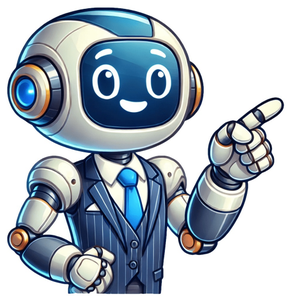
I'm not a robot



Author: Calculator Academy Team Last Updated: July 26, 2023 Enter the distance of the object from the lens and the distance the image is formed from the lens to determine the Magnification. This calculator can also determine the image distance or object distance if the other values are known. The following equation is used to calculate the magnification produced by a lens. Where M is the magnification v is the distance of the image formed by the lens u is the distance of the object from the lens To calculate a magnification magnitude, divide the distance of the image created by the lens from the distance of the object to the lens. Magnification is the process of a lens refracting an image onto a surface and is defined as the ratio of the distance from the image to the distance from the object. How to calculate magnification? First, determine the distance of the object from the lens. Using a measurement device, determine the total distance from the object to the lens. Next, determine the distance of the image formed by the lens. As done in step 1, measure the total distance of the image formed by the lens. Finally, calculate the magnification. Plugin the values from steps 1 and 2 into the formula to calculate the magnification. What is magnification? Magnification is the process of a lens refracted the image of an object onto a surface where its large than the object itself. What does a magnification value mean? A magnification value of 3, for example, means that the image is 3 times the size of the object. Last updated at Dec. 16, 2024 by Teachoo Distance of Object from Optical Centre of the lens is called Object Distance It is denoted by u What is Image Distance Distance of Image from Optical Centre of the lens is called Object Distance It is denoted by v. What is Focal length We have already studied that Distance of Principal Focus from the optical centre of the lens is Called Focal Length It is denoted by f What is lens Formula This formula denotes relationship between Object Distance (u) Image Distance (v) Focal length (f) Note : - We follow the sign convention for lenses In the image, the red text is negative, and blue text is positive Thus, If Virtual image is formed,v is negative If Real Image is formed, v is positive Object Distance (u) is always negative as it is on left side of the lens Focal Length of Convex Lens is Positive Focal Length of Concave Lens is Negative In addition to the mirror formula, we have the magnification formula What is the magnification formula? It is Ratio of Height of Image to the Height of Object Hence it gives extent image is magnified compared to image of object Suppose Height of object is h Height of Image is h' Magnification is m So Magnification = Height of Image/ Height of Object m = h'/h We also have another formula for magnification in lenses Magnification = v/u where v is image distance u is object distance Note: - If magnification (m) is positive, It means image formed is virtual and erect If magnification (m) is negative, It means image formed is real and inverted Questions Example 10.3 - A concave lens has focal length of 15 cm. At what distance should the object from the lens be placed so that it forms an image at 10 cm from the lens? Also, find the magnification produced by the lens. View Answer Example 10.4 - A 2.0 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 10 cm. The distance of the object from the lens is 15 cm. Find the nature, position and size of the image. Also find its magnification. View Answer NCERT Question 9 - One-half of a convex lens is covered with a black paper. Will this lens produce a complete image of the object? Verify your answer experimentally. Explain your observations. View Answer NCERT Question 10 - An object 5 cm in length is held 25 cm away from a converging lens of focal length 10 cm. Draw the ray diagram and find the position, size and the nature of the image formed View Answer NCERT Question 11 - A concave lens of focal length 15 cm forms an image 10 cm from the lens. How far is the object placed from the lens? Draw the ray diagram. View Answer Page 2 Last updated at Dec. 16, 2024 by Teachoo It is the Reciprocal of Focal Length taken in m. Power of lens = 1/Focal Length P = 1/f When Focal Length is Measured in meter (m) Power is Measured in Dioptre (D) To Summarise Let's solve some examples Suppose for a concave lens, focal length is 25 cm.What is the power of the lens? We know that Concave lens has negative focal length Therefore Focal Length = - 25 cm = - 25/100 m = - 1/4 m Now, Power = 1/Focal length = 1/(-1/4) = -4 D Note : - Focal Length of Convex Lens is Positive. So, Power of Convex lens is also Positive Focal Length of Concave Lens is Negative. So, Power of Concave lens is also Negative A person having a myopic eye uses a concave lens of focal length 50 cm. What is the power of the lens? Definition of Focal Length It is the measure of Degree of Convergence and Divergence of a Light Rays Convex Lens Converges Parallel Rays of Light and Concave Lens Diverges Parallel rays of Light Power of Lens is Defined as Reciprocal of Focal Length Lesser the focal Length, More the Power More the Focal Length, Less the Power Power of Combination of Lens If more than 1 one lens are used together, it is called Combination of Lens Power of Combination of Lens is Simple Algebraic sum of all the Lenses Power of Combination of Lens = Power of Lens 1 + Power of Lens 2 P = P 1 + P 2 Questions Question 1 Page 184 - Define 1 dioptre of power of a lens. View Answer Question 2 Page 184 - A convex lens forms a real and inverted image of a needle at a distance of 50 cm from it. Where is the needle placed in front of the convex lens if the image is equal to the size of the object? Also, find the power of the lens View Answer Question 3 Page 184 - Find the power of a concave lens of focal length 2 m. View Answer NCERT Question 16 - Find the focal length of a lens of power 2.0 D. What type of lens is this? View Answer NCERT Question 17 - A doctor has prescribed a corrective lens of power +1.5 D. Find the focal length of the lens. Is the prescribed lens diverging or converging? View Answer ,the free encyclopedia that anyone can edit.117,937 active editors 7,001,149 articles in EnglishThe English-language Wikipedia thanks its contributors for creating more than seven million articles! Learn how you can take part in the encyclopedia's continued improvement.GL Mk.II transmitter vanRadar, Gun Laying, MarkI, or GL Mk.I for short, was an early World WarII radar system developed by the British Army to provide information for anti-aircraft artillery. There were two upgrades, GL/EF (elevation finder) and GL Mk.II (pictured), both improving the ability to determine a target's bearing and elevation. GL refers to the radar's ability to direct the guns onto a target, known as gun laying. The first GL sets were developed in 1936 using separate transmitters and receivers mounted on gun carriages. Several were captured in 1940, leading the Germans to believe falsely that British radar was much less advanced than theirs. The GL/EF attachment provided bearing and elevation measurements accurate to about a degree: this caused the number of rounds needed to destroy an aircraft to fall to 4,100, a tenfold improvement over early-war results. The Mk.II, which was able to directly guide the guns, lowered the rounds-per-kill to 2,750. About 410 Mk.Is and 1,679 Mk.IIs were produced. (Fullarticle...)Recently featured: Andrea NavageroNosy KombaMcDonnell Douglas Phantom in UK serviceArchiveBy emailMore featured articlesAboutLieke Klaver ahead in the women's 400 metres final... that a 400-metre race in 2025 (pictured) was won by Lieke Klaver, who pretended that an absent competitor was running in front of her?... that the land snail Drymaeus poecilus is notable for the striking variety of colors and patterns on its shell?... that a forensic investigation of Signalgate has determined how a journalist was included in a group chat about Operation Rough Rider?... that two of the players involved in the 2005 Vietnamese football match-fixing scandal did not accept payment because they felt ashamed?... that a rebellion against a peace treaty with the Yuan dynasty operated out of the Historic Site of Anti-Mongolian Struggle on Jeju Island?... that Nathan Frink fled the United States with enslaved children to settle in Canada, where he was elected as a Member of the Legislative Assembly and caught in a smuggling conspiracy?... that Seattle's women's ice hockey team has an expected rival, despite not even having played their first game?... that Cave Johnson Couts was separately acquitted for shooting his foreman, firing on funeral mourners, and whipping a native laborer to death?... that characters' scars in an episode of The Last of Us were made with a paste-based appliance and a food mixer?ArchiveStart a new articleNominate an articleNgg wa Thiong'oKenyan writer and activist Ngg wa Thiong'o (pictured) dies at the age of 87.In sumo, nosato Daiki is promoted to yokozuna.In association football, Liverpool win the Premier League title.In motor racing, lex Palou wins the Indianapolis 500.Ongoing: Gaza warM23 campaignRussian invasion of UkrainetimelineSudanese civil wartimelineRecent deaths: Phil RobertsonMary K. GaillardPeter DavidAlan YentobGerry ConnollySebastio SalgadoNominate an articleMay 30: Statehood Day in Croatia (1990)Johann Sebastian Bach1431 Hundred Years' War: After being convicted of heresy, Joan of Arc was burned at the stake in Rouen, France.1723 Johann Sebastian Bach (pictured) assumed the office of Thomaskantor in Leipzig, presenting the cantata Die Elenden sollen essen in St.Nicholas Church.1922 The Lincoln Memorial in Washington, D.C., featuring a sculpture of the sixteenth U.S. president Abraham Lincoln by Daniel Chester French, opened.1963 Buddhist crisis: A protest against pro-Catholic discrimination was held outside the National Assembly of South Vietnam in Saigon, the first open demonstration against President Ng nh Dim.2008 The Convention on Cluster Munitions, prohibiting the use, transfer, and stockpiling of cluster bombs, was adopted.Ma Xifan (d.947)Colin Blythe (b.1879)Norris Bradbury (b.1909)Wynonna Judd (b.1964)More anniversaries: May 29May 30May 31ArchiveBy emailList of days of the yearAboutSeventeen performing "Oh My!" in 2018South Korean boy band Seventeen made their debut on May 26, 2015, when they performed a showcase for their debut EP 17 Carat in front of a crowd of 1,000 people. Since then, the group have held 9 concert tours, 13 fan meetings, and have performed at a number of music festivals and awards shows. Their concert tours include the Right Here World Tour, which sold over one million tickets, and the Follow Tour, which was noted by Billboard as being the top grossing K-pop tour of 2023. In 2024, Seventeen made their first appearances at festivals in Europe, when they were the first South Korean act to perform at Glastonbury Festival's Pyramid Stage and as headliners for Lollapalooza Berlin. Seventeen's live performances are well regarded by fans and critics alike, and garnered them the award for Top K-pop Touring Artist at the 2024 Billboard Music Awards. (Fulllist...)Recently featured: Accolades received by Top Gun: MaverickNational preserve76th Primetime Emmy AwardsArchiveMore featured listsIgnace Tonen (1840 or 1841 15 March 1916), also known as Nias or by his Ojibwe name Maiagizis ('right/correct sun'), was a Teme-Augama Anishnabai chief, fur trader, and gold prospector in Upper Canada. He was a prominent employee of the Hudson's Bay Company. Tonen was the elected deputy chief before being the lead chief and later the life chief of his community. In his role as deputy, he negotiated with the Canadian federal government and the Ontario provincial government, advocating for his community to receive annual financial support from both. His attempts to secure land reserves for his community were thwarted by the Ontario premier Oliver Mowat. Tonen's prospecting triggered a 1906 gold rush and the creation of Kerr Addison Mines Ltd., although one of his claims was stolen from him by white Canadian prospectors. This photograph shows Tonen in 1909.Photograph credit: William John Winter; restored by Adam CuerdenRecently featured: Australian white ibisHell Gate BridgeAnemonoides blandaArchiveMore featured picturesCommunity portal The central hub for editors, with resources, links, tasks, and announcements.Village pump Forum for discussions about Wikipedia itself, including policies and technical issues.Site news Sources of news about Wikipedia and the broader Wikimedia movement.Teahouse Ask basic questions about using or editing Wikipedia.Help desk Ask questions about using or editing Wikipedia.Reference desk Ask research questions about encyclopedic topics.Content portals A unique way to navigate the encyclopedia.Wikipedia is written by volunteer editors and hosted by the Wikimedia Foundation, a non-profit organization that also hosts a range of other volunteer projects: CommonsFree media repository MediaWikiWiki software development Meta-WikiWikimedia project coordination WikibooksFree textbooks and manuals WikidataFree knowledge base WikinewsFree-content news WikiquoteCollection of quotations WikisourceFree-content library WikispeciesDirectory of species WikiversityFree learning tools WikivoyageFree travel guide WiktionaryDictionary and thesaurusThis Wikipedia is written in English. Many other Wikipedias are available; some of the largest are listed below. 1,000,000+ articles DeutschEspaolFranaisItalianoNederlandsPolskiPortugusSvenskaTing Vit 250,000+ articles Bahasa IndonesiaBahasa MelayuBn-lm-gCataletinaDanskEestiEsperantoEuskaraMagyarNorsk bokmlRomnSimple EnglishSlovenina SrpskiSrpskohrvatskiSuomiTrkeOzbekcha 50,000+ articles AsturianuAzrbaycancaBosanskiFryskGaeilgeGalegoHrvatskiKurdLatvieuLietuviNorsk nynorskShqipSlovenina Retrieved from " 2EP by Seventeen17 CaratEP by SeventeenReleasedMay29,2015(2015-05-29)GenreK-popdance-pophip hopLength16:48LanguageKoreanLabelPledis EntertainmentLOEN EntertainmentSeventeen chronology17 Carat(2015)Boys Be(2015)Singles from 17 Carat "Adore U"Released: May 29, 201517 Carat is the debut extended play (EP) by South Korean boy group Seventeen. It was released on May 29, 2015, by Pledis Entertainment and distributed by LOEN Entertainment. "Adore U" serves as the lead single for the EP.17 Carat features five tracks written, co-written, and co-produced by Seventeen's group members. "Adore U" was chosen as the lead single for the EP and was performed on multiple music shows by the group. "Shining Diamond" was used as a pre-single on the group's reality debut show. The group stated that the tracklist was chosen to reflect Seventeen's core concept of "boys' passion".[1] The album has two physical versions: one with a "black" themed photo card set, and the other with a "white" themed photo card set. All copies include a CD containing the songs and a fold-up poster/lyric sheet."Adore U" is the lead single of the extended play. It was written by Woozi, S.Coups, and Yeon Dong-geon.[2] The Korea Herald states "'Adore U' is a funky pop song about a teenage boy trying to navigate through puppy love."[3] It marks the beginning of the group's trilogy composed of the singles Adore U, Mansae, and Pretty U about a boy meeting, falling in love and asking out a girl. The track was composed and arranged by Woozi, Bumzu, and Yeon Dong-geon. The music video for the single was released on May 29, 2015, and was directed by Dee Shin. The dance choreography accompaniment to the song was choreographed by Hoshi and focuses on "storytelling, and on highlighting each member's strengths onstage".[4] The single has sold more than 38,000 digital copies and peaked at number 13 on the Billboard US World Chart.The EP has sold over 82,972 copies in South Korea.[5] It peaked at number 4 on the Korean Gaon Album Chart[6] and number 8 on the US World Billboard Chart.[7]Year-end listsCritic/publicationListRankRef.BillboardThe 10 Best K-pop Album of 2015Placed[8]Hoshi participated in the choreography of "Adore U" and "Shining Diamond", Dino choreographed "Jam Jam".[9]Official track list[10]No.TitleLyricsMusicArrangementsLength1."Shining Diamond"WooziVernonS.CoupsKim Min-jeongWooziMasterKeyRishiMasterKeyRishi3:242.""Adore U"" (; Akkinda)WooziVernonS.CoupsBumzuWooziBumzuYeon Dong-geonWooziBumzuYeon Dong-geon3:073."Ah Yeah" (Hip-Hop unit)S. CoupsVernonWonwooMingyuCream DoughnutRishiCream DoughnutRishi3:294."Jam Jam" (Performance unit + Vernon)WooziHoshiDinoVernonWooziCream DoughnutCream Doughnut3:255."20" (Vocal unit)WooziWooziWon Yeong-heonWon Yeong-heonDong Ne-hyeong3:23Weekly chart performance for 17 CaratChart (2015-2023)PeakpositionJapanese Albums (Oricon)[11]46South Korean Albums (Gaon)[12]4US World Albums (Billboard)[13]8Year-end chart performance for 17 CaratChart (2015)PeakpositionSouth Korean Albums (Gaon)[14]47^ "Seventeen hopes to shine like diamonds with '17 Carat'". The Korea Herald. 26 May 2015. Retrieved 30 November 2016.^ "Adore U". Color Coded Lyrics. 29 May 2015. Retrieved 29 November 2016.^ "Seventeen hopes to shine like diamonds with '17 Carat". The Korea Herald. 26 May 2015. Retrieved 30 November 2016.^ "Seventeen hopes to shine like diamonds with '17 Carat'". The Korea Herald. 26 May 2015. Retrieved 30 November 2016.^ Cumulative sales of 17 Carat:"2015 Album Chart"."2016 12 Album Chart"."2017 11 Album Chart".^ "2015 Albums". Gaon Music Chart. Korea Music Content Industry Association. Archived from the original on September 10, 2016. Retrieved November 29, 2016.^ "June 27, 2015". Billboard. Retrieved 29 November 2016.^ Benjamin, Jeff; Oak, Jessica (December 12, 2015). "The 10 Best K-Pop Albums of 2015". Billboard. Archived from the original on September 18, 2021. Retrieved October 31, 2021.^ , (18 June 2015). "[My Name] (3) - , , , | ". (in Korean). The Korea Economic Daily. . Retrieved 18 July 2021.^ "SEVENTEEN 1st Mini Album '17 CARAT'".^ " 20230710" [Weekly album ranking as of July 10, 2023]. Oricon News (in Japanese). Archived from the original on July 5, 2023. Retrieved February 18, 2024.^ "2015 27 Album Chart". Gaon Chart (in Korean). Archived from the original on August 7, 2016. Retrieved February 18, 2024.^ "Seventeen Chart History (World Albums)". Billboard. Retrieved February 17, 2024.^ "2015 Album Chart". Gaon Chart (in Korean). Archived from the original on May 7, 2017. Retrieved February 17, 2024.Retrieved from " 3The following pages link to 17 Carat External tools(link counttransclusion countsorted list) See help page for transcluding these entriesShowing 50 items.View (previous 50 | next 50) (20 | 50 | 100 | 250 | 500)Main Page (links | edit)Pledis Entertainment discography (links | edit)List of 2015 albums (links | edit)2015 in South Korean music (links | edit)Seventeen (South Korean band) (links | edit)S.Coups (links | edit)Vernon (rapper) (links | edit)Wonwoo (links | edit)List of awards and nominations received by Seventeen (links | edit)Seventeen discography (links | edit)Love & Letter (links | edit)Joshua (singer) (links | edit)Seventeen TV (links | edit)17 carat (redirect page) (links | edit)Going Seventeen (links | edit)List of Seventeen live performances (links | edit)Teen, Age (links | edit)Al1 (links | edit)Bumzu (links | edit)Boys Be (EP) (links | edit)You Make My Day (links | edit)You Made My Dawn (links | edit)Jun (Chinese entertainer) (links | edit)List of Stray Kids live performances (links | edit)The8 (links | edit)An Ode (links | edit)Seungkwan (links | edit)Fallin' Flower (links | edit)Heng:gar (links | edit)Semicolon (EP) (links | edit)Your Choice (links | edit)Going Seventeen (web series) (links | edit)Not Alone (Seventeen song) (links | edit)Attacca (EP) (links | edit)Rock with You (Seventeen song) (links | edit)Woozi (links | edit)Hoshi (South Korean singer) (links | edit)Don't Wanna Cry (Seventeen song) (links | edit)Darl+ing (links | edit)Face the Sun (links | edit)Left & Right (Seventeen song) (links | edit)24H (EP) (links | edit)We Make You (links | edit)Hot (Seventeen song) (links | edit)Dream (Seventeen EP) (links | edit)BSS (band) (links | edit)FML (EP) (links | edit)Super (Seventeen song) (links | edit)Always Yours (album) (links | edit)Seventeenth Heaven (links | edit)View (previous 50 | next 50) (20 | 50 | 100 | 250 | 500)Retrieved from " WhatLinksHere/17_Carat"Davide BorchiaPhysicist by education, scientist by vocation. He holds a masters degree in complex systems physics with a specialization in quantum technologies. If he is not reading something, he is outdoors trying to enjoy every bit of nature around him. He uses his memory as an advantage, and everything you will read from him contains at least one I read about this five years ago moment! See full profileCheck our editorial policyAnna Szczepanek, PhDPhD, Jagiellonian University in Krakw, PolandAnna Szczepanek, PhD is a mathematician at the Faculty of Mathematics and Computer Science of the Jagiellonian University in Krakw, where she researches mathematical physics and applied mathematics. At Omni, Anna uses her knowledge and programming skills to create math and statistics calculators. In her free time, she enjoys hiking and reading. See full profileCheck our editorial policy10 people find this calculator helpfulOur lens magnification calculator will focus on the world of lenses in photography, finally explaining what magnification is, why it is different from zoom, and much more!Here you will learn:The basics of optics, lenses, and images;What is the magnification of a lens?How to calculate the magnification of a lens the magnification formula;An example involving kangaroos; andWhen do we need extender tubes? And that's not all magnify your knowledge with Omni Calculator!A camera is nothing but lenses and a sensor. At least in theory! To understand how it works, we need to explore the world of optics.A lens is a device made of a material with a different refraction index to air (there can even be electromagnetic lenses that act on electric currents). This and its shape allows it to bend rays of light as they come into contact with it.Lenses can focus or "unfocus" light rays. In this tool, we will only consider converging lenses. Their main feature is the ability to focus every ray entering the lens parallel to the optical axis at a specific point, the focus.The distance between the focus and the lens is the focal length fff. Lenses and their properties have been known by humanity for a long time. However, only in the 13 century did lens-making skills reach a level of refinement that allowed for the construction of glasses, telescopes, and much more!The diagram below will help explain the operating principles of a lens:A lens creates an inverted and magnified image of an object.First thing the upward facing arrow on the left of the image is the object we are looking at. The rays of light coming from it hit the lens. The one parallel to the optic axis (the topmost line) gets focused and so converges on the focus. The ray passing through the center of the lens meets the focused ray on the other side of the lens, which creates a flipped image called the real image of the object.We can easily identify the main elements that we need in the description of a lens:The focal length fff; andThe focus distance ddd, given by d=g+hd=g+hd=g+h; we can, in turn, identify:The distance between the real image and the lens, hhh; andThe distance between the object and the lens, ggg.The distance hhh is where the image is focused, thus where it can be observed with maximum sharpness. The word "focus" comes from Latin for "fireplace". This is because the Romans believed that their ancestral gods were located in the fireplace, or hearth, and so would direct (or focus) their worship towards it.The magnification of a lens is an absolute measure of how much the height of a real image differs from the object's height. Remember, that in a camera, the real image forms on the sensor (or on the film, if you're old school).Now consider that the sensor is at most a few centimeters wide, while you can take a picture of the Eiffel Tower, which is 330m330\ \text{m}330m tall. Even from afar and with a powerful telephoto lens, you'll always get a magnification that is much smaller than you expect when taking pictures with a camera.The formula for the magnification of a lens is:Thanks to the properties of similar triangles, we can compute the magnification of a lens also using the distances between the object/image and the lens:This allows you to adjust hhh by slightly moving the lens an action you did many times before taking the picture.We can shuffle the equations a little to find a magnification formula that uses focal length and object distance:m=d2rd2+rm = \frac{\tfrac{d}{2} - r}{\tfrac{d}{2} + r}m=2d+r2drrrr is the square root of the following quadratic equation:r=d24fdr =\sqrt{\frac{d^2}{4} - f \cdot d}r=4d2fdIf you'd like to know more, try our others optic calculators dedicated to lenses, like the thin lens equation calculator or the lens maker equation calculator.When you are snapping a picture, you don't usually know the values of hhh and ggg, but you know the focal length for sure, and you likely know the distance between you and your subject. These two quantities are enough for you to calculate the magnification of your lens!Imagine you are taking a picture of a huge kangaroo, let's say two meters tall and weighing 95kg95\ \text{kg}95kg, like the one that terrorized Brisbane a few years ago.The right lens will help you maintaining a safe distance for extremely tall kangaroos.Since that beast would be too dangerous to photograph at a close distance, we suggest you use a 500mm500\ \text{mm}500mm telephoto lens. We advise you to keep your distance, let's say 150 meters (but remember that a kangaroo can reach a maximum speed of 70m/s70\ \text{m/s}70m/s). Insert these values into our magnification of a lens calculator, which will return:m=0.003356m=0.003356m=0.003356See? The value is way smaller than 111. However (trust us), that kangaroo would look larger than life in the picture.The values of hhh and ggg are hidden in the further magnification properties section of our calculator, so if you need to know either of these, just click the button!Magnifying glasses are perfect for explaining the principles of magnification (the clue is in the name).Their lenses are usually manufactured with a focal length of 25cm25\ \text{cm}25cm. If you use the lens to look at an object closer to it than that distance, you create a virtual image of the object.Do you remember the diagram we showed you already? We need to modify it slightly!A magnifying glass create a "straight" and magnified image of the object placed at a distance ggg from it. But there are some conditions!As you can see, now the rays on the right side of the lens do not converge. We are dealing in terms of virtual images, which originate from the virtual continuations of the rays, creating a non reversed image of the object.If you consider the lens magnification formula using the heights of the image and the object:The result is straightforwardly larger than 111: a proper magnifier!How do you increase the magnification of a lens? Well, there are only two options:Decrease the distance ggg between the camera and your subject; orIncrease the distance hhh between the lens and the sensor.In the case of violent kangaroos, it may be better to go for the second option: that's why camera manufacturers sell extension tubes, short rings to mount between the lens and the body, which end up increasing hhh by some precious millimeters.Expand the further magnification properties section to see the variable extension tube. We set it at 0mm0\ \text{mm}0mm by default, but change it according to your needs!Maybe you expected the magnification to be a bigger number, something like 1010\times10 or 2020\times20, like the values you see on binoculars or telescopes (we made an entire calculator for that, check out our telescope magnification calculator).However, when talking cameras, the magnification is usually a really small number. The number followed by a \times is the zoom.The zoom describes how much the lens's focal length can change by (there are such things as zoom lenses). A typical 18/5518/5518/55 lens will have its zoom defined by:zoom=55183\rm zoom = \frac{55}{18}\simeq3zoom=18553We hope that the distinction is clear!Are you still looking for photography-related calculators? Check out our shutter speed calculator.FAQsTo calculate the magnification of a lens, you must know either:The distance of the object from the lens g and the distance between lens and sensor h; orThe distance between sensor and object d and the focal length f.The magnification formula is: m = h/g.Or alternatively:m = (d/2 - r) / (d/2 + r),where r is equal to (d/4 - f d).In photography, the magnification of a lens is the ratio between the height of the image projected onto the sensor or film of the camera and the height of the real image you are taking a picture of.Since, in most cases (unless you are using a microscope), the lens shrinks the object, the magnification value is less than 1.The magnification of a lens with focal length 55 mm at a distance of 100 m is m = 0.0005506. To calculate it, follow the steps:Calculate r = sqrt(d/4 - f d) = 49.945.Calculate:The distance between the object and lens: g = d/2 + r = 99.945; andThe distance between the lens and sensor: h = d/2 - r = 0.05503.Compute the magnification with the ratio m = h/g = 0.0005506.The magnification of a lens is an absolute value that depends on the focal length of the lens itself, while the zoom is a relative quantity that describes how much you can change the focal length of a lens by, thus changing its magnification.The perceived magnification of an object, thanks to the use of powerful telephoto lenses, comes from the reduced projection of the object onto relatively small sensors. If that projected image can change the size, let's say by a factor of two, we say that the lens has a 2 zoom.Did we solve your problem today?Check out 27 similar photo and video calculators Note: A converging lens is wider in the middle than it is at the edges (like a magnifying glass.) A diverging lens is wider at the edges than it is in the middle (like a bowl).[1] Finding magnification is the same for both, with one important exception. Click here to go straight to the diverging lens exception.1Start with your equation and determine which variables you know.[2] Like with many other physics problems, a good way to approach magnification problems is to first write the equation you need to find your answer. From here, you can work backwards to find any pieces of the equation that you need.[3]For example, let's say that a 6 centimeter tall action figure is placed half a meter away from a converging lens with a focal length of 20 centimeters. If we want to find the magnification, image size, and image distance, we can start by writing our equation like this:M = (hi/ho) = -(di/do)Right now, we know ho (the height of the action figure) and do (the distance of the action figure from the lens.) We also know the focal length of the lens, which isn't in this equation. We need to find hi, di, and M. 2Use the lens equation to get di. If you know the distance of the object you're magnifying from the lens and the focal length of the lens, finding the distance of the image is easy with the lens equation. The lens equation is 1/f = 1/do + 1/di, where f = the focal length of the lens.[4]In our example problem, we can use the lens equation to find di. Plug in your values for f and do and solve:1/f = 1/do + 1/di1/20 = 1/50 + 1/di5/100 - 2/100 = 1/di3/100 = 1/di100/3 = di = 33.3 centimetersA lens's focal length is the distance from the center of the lens to the point where the rays of light converge in a focal point. If you've ever focused light through a magnifying glass to burn ants, you've seen this. In academic problems, this is often given to you. In real life, you can sometimes find this information labeled on the lens itself. Advertisement 3Solve for hi. Once you know do and di, you can find the height of the magnified image and the magnification of the lens. Notice the two equals signs in the magnification equation (M = (hi/ho) = -(di/do)) this means that all of the terms are equal to each other, so we can find M and hi in whatever order we want.[5]For our example problem, we can find hi like this:(hi/ho) = -(di/do)(hi/6) = -(33.3/50)hi = -(33.3/50) 6hi = -3.996 cmNote that a negative height indicates that the image we see will be inverted (upside down).4Solve for M. You can solve for your final variable using either -(di/do) or (hi/ho).[6]In our example, we would finally find M like this:M = (hi/ho)M = (-3.996/6) = -0.666We also get the same answer if we use our d values:M = -(di/do)M = -(33.3/50) = -0.666Note that magnification does not have a unit label.5Interpret your M value. Once you have a magnification value, you can predict several things about the image you would view through the lens. These are:Its size. The bigger the absolute value of the M value, the bigger the object will seem under magnification. M values between 1 and 0 indicate that the object will look smaller.Its orientation. Negative values indicate that the image of the object will be inverted.In our example, our M value of -0.666 means that, under the conditions given, the image of the action figure will appear upside down and two-thirds its normal size.6For diverging lenses, use a negative focal length value. Even though diverging lenses look very different than converging lenses, you can find their magnification values using the same formulas as above. The one important exception here is that divergent lenses will have negative focal lengths. In a problem like the one above, this will affect the answer you get for di, so be sure to pay close attention.[7]Let's re-do the example problem above, only this time, we'll say we're using a diverging lens with a focal length of -20 centimeters. All of the other starting values are the same.First, we'll find di with the lens equation:1/f = 1/do + 1/di1/-20 = 1/50 + 1/di-5/100 - 2/100 = 1/di-7/100 = 1/di-100/7 = di = -14.29 centimetersNow we'll find hi and M with our new di value.(hi/ho) = -(di/do)(hi/6) = -(-14.29/50)hi = -(-14.29/50) 6hi = 1.71 centimetersM = (hi/ho)M = (1.71/6) = 0.285 Advertisement Easy Two-Lens MethodFind the focal length of both lenses. When you're dealing with a device that is made up of two lenses lined up with each other (like a telescope or one part of a pair of binoculars), all you need to know is the focal length of both lenses to find the overall magnification of the final image. This is done with the simple equation M = fo/fe.[8]In the equation, fo refers to the focal length of the objective lens and fe to the focal length of the eyepiece lens. The objective lens is the large lens at the end of the device, while the eyepiece lens is, as its name suggests, the small lens you put your eye next to.Plug your information into M = fo/fe. Once you have the focal lengths for both of your lenses, solving is easy just find the ratio by dividing the objective's focal length by the eyepiece's. The answer you get will be the magnification of the device.For example, let's say that we have a small telescope. If the focal length of the objective lens is 10 centimeters and the focal length of the eyepiece lens is 5 centimeters, the magnification is simply 10/5 = 2. Detailed MethodFind the distance between the lenses and the object. If you have two lenses lined up in front of an object, it's possible to determine the magnification of the final image if you know the distances of the lenses and objects in relation to each other, the size of the object, and the focal lengths of both lenses. Everything else can be derived. For example, let's say that we have the same setup as in our example problem in Method 1: a six-inch action figure 50 centimeters away from a converging lens with a focal length of 20 centimeters. Now, let's put a second converging lens with a focal length of 5 centimeters 50 centimeters behind the first lens (100 centimeters away from the action figure.) In the next few steps, we'll use this information to find the magnification of the final image.Find the image distance, height, and magnification for lens one. The first part of any multi-lens problem is the same as if you were dealing with just the first lens. Starting with the lens closest to the object, use the lens equation to find the distance of the image, then use the magnification equation to find its height and magnification. Click here for a recap of single-lens problems. From our work in Method 1 above, we know that the first lens produces an image -3.996 centimeters high, 33.3 centimeters behind the lens, and with a magnification of -0.666.Use the image from the first lens as the object for the second. Now, finding the magnification, height, and so on for the second lens is easy just use the same techniques that you used for the first lens, only this time, use its image in place of the object. Keep in mind that the image will usually be a different distance from the second lens as the object was from the first one.[9]In our example, since the image is 33.3 centimeters behind the first lens, it is 50-33.3 = 16.7 centimeters in front of the second one. Let's use this and the new lens's focal length to find the second lens's image.1/f = 1/do + 1/di1/5 = 1/16.7 + 1/di0.2 - 0.0599 = 1/di0.14 = 1/didi = 7.14 centimetersNow, we can find hi and M for the second lens:(hi/ho) = -(di/do)(hi/-3.996) = -(7.14/16.7)hi = -(0.427) -3.996hi = 1.71 centimetersM = (hi/ho)M = (1.71/-3.996) = -0.428Continue on in this pattern for additional lenses. This basic approach is the same whether you have three, four, five, or a hundred lenses lined up in front of an object. For each lens, treat the image of the previous lens as its object and use the lens equation and magnification equation to find your answers.Keep in mind that subsequent lenses can continue to invert your image. For instance, the magnification value we got above (-0.428) indicates that the image we see will be about 4/10 the size of the image from the first lens, but right side up, since the image from the first lens was upside down. Add New Question Question What does it mean when a magnifying glass is 100mm - 5x? Its diameter is 100 mm, and it makes objects appear to be five times their actual size. Question How does percent magnification convert to x times magnification? 100% magnification equals 2x magnification. 200% = 3x. 300% = 4x, and so forth. Question Should I look at the sign on the value of magnification to know if the image is larger than the object? No, the sign is related to whether the image is (-) or isn't (+) inverted in relation to the object. You know that the image is larger if the value is bigger than one M > 1. Ask a Question Advertisement Thanks Thanks Advertisement This article was reviewed by Grace Imson, MA. Grace Imson is a math teacher with over 40 years of teaching experience. Grace is currently a math instructor at the City College of San Francisco and was previously in the Math Department at Saint Louis University. She has taught math at the elementary, middle, high school, and college levels. She has an MA in Education, specializing in Administration and Supervision from Saint Louis University. This article has been viewed 380,349 times. Co-authors: 14 Updated: April 16, 2025 Views:380,349 Categories: Physics PrintSend fan mail to authors Thanks to all authors for creating a page that has been read 380,349 times. "It helped me to increase my grades and I understood it better." Share your story Note: A converging lens is wider in the middle than it is at the edges (like a magnifying glass.) A diverging lens is wider at the edges than it is in the middle (like a bowl).[1] Finding magnification is the same for both, with one important exception. Click here to go straight to the diverging lens exception.1Start with your equation and determine which variables you know.[2] Like with many other physics problems, a good way to approach magnification problems is to first write the equation you need to find your answer. From here, you can work backwards to find any pieces of the equation that you need.[3]For example, let's say that a 6 centimeter tall action figure is placed half a meter away from a converging lens with a focal length of 20 centimeters. If we want to find the magnification, image size, and image distance, we can start by writing our equation like this:M = (hi/ho) = -(di/do)Right now, we know ho (the height of the action figure) and do (the distance of the action figure from the lens.) We also know the focal length of the lens, which isn't in this equation. We need to find hi, di, and M. 2Use the lens equation to get di. If you know the distance of the object you're magnifying from the lens and the focal length of the lens, finding the distance of the image is easy with the lens equation. The lens equation is 1/f = 1/do + 1/di, where f = the focal length of the lens.[4]In our example problem, we can use the lens equation to find di. Plug in your values for f and do and solve:1/f = 1/do + 1/di1/20 = 1/50 + 1/di5/100 - 2/100 = 1/di3/100 = 1/di100/3 = di = 33.3 centimetersA lens's focal length is the distance from the center of the lens to the point where the rays of light converge in a focal point. If you've ever focused light through a magnifying glass to burn ants, you've seen this. In academic problems, this is often given to you. In real life, you can sometimes find this information labeled on the lens itself. Advertisement 3Solve for hi. Once you know do and di, you can find the height of the magnified image and the magnification of the lens. Notice the two equals signs in the magnification equation (M = (hi/ho) = -(di/do)) this means that all of the terms are equal to each other, so we can find M and hi in whatever order we want.[5]For our example problem, we can find hi like this:(hi/ho) = -(di/do)(hi/6) = -(33.3/50)hi = -(33.3/50) 6hi = -3.996 cmNote that a negative height indicates that the image we see will be inverted (upside down).4Solve for M. You can solve for your final variable using either -(di/do) or (hi/ho).[6]In our example, we would finally find M like this:M = (hi/ho)M = (-3.996/6) = -0.666We also get the same answer if we use our d values:M = -(di/do)M = -(33.3/50) = -0.666Note that magnification does not have a unit label.5Interpret your M value. Once you have a magnification value, you can predict several things about the image you would view through the lens. These are:Its size. The bigger the absolute value of the M value, the bigger the object will seem under magnification. M values between 1 and 0 indicate that the object will look smaller.Its orientation. Negative values indicate that the image of the object will be inverted.In our example, our M value of -0.666 means that, under the conditions given, the image of the action figure will appear upside down and two-thirds its normal size.6For diverging lenses, use a negative focal length value. Even though diverging lenses look very different than converging lenses, you can find their magnification values using the same formulas as above. The one important exception here is that divergent lenses will have negative focal lengths. In a problem like the one above, this will affect the answer you get for di, so be sure to pay close attention.[7]Let's re-do the example problem above, only this time, we'll say we're using a diverging lens with a focal length of -20 centimeters. All of the other starting values are the same.First, we'll find di with the lens equation:1/f = 1/do + 1/di1/-20 = 1/50 + 1/di-5/100 - 2/100 = 1/di-7/100 = 1/di-100/7 = di = -14.29 centimetersNow we'll find hi and M with our new di value.(hi/ho) = -(di/do)(hi/6) = -(-14.29/50)hi = -(-14.29/50) 6hi = 1.71 centimetersM = (hi/ho)M = (1.71/6) = 0.285 Advertisement Easy Two-Lens MethodFind the focal length of both lenses. When you're dealing with a device that is made up of two lenses lined up with each other (like a telescope or one part of a pair of binoculars), all you need to know is the focal length of both lenses to find the overall magnification of the final image. This is done with the simple equation M = fo/fe.[8]In the equation, fo refers to the focal length of the objective lens and fe to the focal length of the eyepiece lens. The objective lens is the large lens at the end of the device, while the eyepiece lens is, as its name suggests, the small lens you put your eye next to.Plug your information into M = fo/fe. Once you have the focal lengths for both of your lenses, solving is easy just find the ratio by dividing the objective's focal length by the eyepiece's. The answer you get will be the magnification of the device.For example, let's say that we have a small telescope. If the focal length of the objective lens is 10 centimeters and the focal length of the eyepiece lens is 5 centimeters, the magnification is simply 10/5 = 2. Detailed MethodFind the distance between the lenses and the object. If you have two lenses lined up in front of an object, it's possible to determine the magnification of the final image if you know the distances of the lenses and objects in relation to each other, the size of the object, and the focal lengths of both lenses. Everything else can be derived. For example, let's say that we have the same setup as in our example problem in Method 1: a six-inch action figure 50 centimeters away from a converging lens with a focal length of 20 centimeters. Now, let's put a second converging lens with a focal length of 5 centimeters 50 centimeters behind the first lens (100 centimeters away from the action figure.) In the next few steps, we'll use this information to find the magnification of the final image.Find the image distance, height, and magnification for lens one. The first part of any multi-lens problem is the same as if you were dealing with just the first lens. Starting with the lens closest to the object, use the lens equation to find the distance of the image, then use the magnification equation to find its height and magnification. Click here for a recap of single-lens problems. From our work in Method 1 above, we know that the first lens produces an image -3.996 centimeters high, 33.3 centimeters behind the lens, and with a magnification of -0.666.Use the image from the first lens as the object for the second. Now, finding the magnification, height, and so on for the second lens is easy just use the same techniques that you used for the first lens, only this time, use its image in place of the object. Keep in mind that the image will usually be a different distance from the second lens as the object was from the first one.[9]In our example, since the image is 33.3 centimeters behind the first lens, it is 50-33.3 = 16.7 centimeters in front of the second one. Let's use this and the new lens's focal length to find the second lens's image.1/f = 1/do + 1/di1/5 = 1/16.7 + 1/di0.2 - 0.0599 = 1/di0.14 = 1/didi = 7.14 centimetersNow, we can find hi and M for the second lens:(hi/ho) = -(di/do)(hi/-3.996) = -(7.14/16.7)hi = -(0.427) -3.996hi = 1.71 centimetersM = (hi/ho)M = (1.71/-3.996) = -0.428Continue on in this pattern for additional lenses. This basic approach is the same whether you have three, four, five, or a hundred lenses lined up in front of an object. For each lens, treat the image of the previous lens as its object and use the lens equation and magnification equation to find your answers.Keep in mind that subsequent lenses can continue to invert your image. For instance, the magnification value we got above (-0.428) indicates that the image we see will be about 4/10 the size of the image from the first lens, but right side up, since the image from the first lens was upside down. Add New Question Question What does it mean when a magnifying glass is 100mm - 5x? Its diameter is 100 mm, and it makes objects appear to be five times their actual size. Question How does percent magnification convert to x times magnification? 100% magnification equals 2x magnification. 200% = 3x. 300% = 4x, and so forth. Question Should I look at the sign on the value of magnification to know if the image is larger than the object? No, the sign is related to whether the image is (-) or isn't (+) inverted in relation to the object. You know that the image is larger if the value is bigger than one M > 1. Ask a Question Advertisement Thanks Thanks Advertisement This article was reviewed by Grace Imson, MA. Grace Imson is a math teacher with over 40 years of teaching experience. Grace is currently a math instructor at the City College of San Francisco and was previously in the Math Department at Saint Louis University. She has taught math at the elementary, middle, high school, and college levels. She has an MA in Education, specializing in Administration and Supervision from Saint Louis University. This article has been viewed 380,349 times. Co-authors: 14 Updated: April 16, 2025 Views:380,349 Categories: Physics PrintSend fan mail to authors Thanks to all authors for creating a page that has been read 380,349 times. "It helped me to increase my grades and I understood it better." Share your story In order to continue enjoying our site, we ask that you confirm your identity as a human. Thank you very much for your cooperation.

What is the magnification formula for concave lens. What is the magnification formula class 10. What is the magnification formula in physics. What is the magnification formula quizlet. What is the magnification formula for convex lens. What is the magnification formula of a spherical mirror. What is the magnification formula of simple microscope. What is the magnification formula for lens. What is the magnification formula of compound microscope. What is the magnification formula for mirror. What is the magnification formula for convex mirror. What is the magnification formula brainly. What is the magnification formula of concave mirror. What is the magnification formula for lenses. What is the magnification formula of lens class 10.