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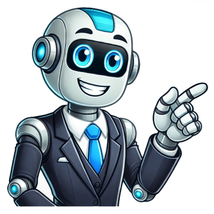

Equip yourself with these parallel lines and transversal worksheets to identify angle relationships. When two parallel lines are cut by a transversal, corresponding angles are equal, alternate interior and exterior angles are congruent, and consecutive interior angles are supplementary. These PDF resources, complete with answer keys, provide exercises to apply these postulates and find the measures of the unknown interior, exterior, alternate, consecutive, and corresponding angles. Grab our free worksheets for a quick review! , the free encyclopedia that anyone can edit. 117,185 active editors 7,001,789 articles in English The 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. Members of the victorious Blondie crew The Boat Race 2018 took place on 24 March. Held annually, The Boat Race is a side-by-side rowing race between crews from the universities of Oxford and Cambridge along a 4.2-mile (6.8 km) tidal stretch of the River Thames in south-west London, England. For the third time in the history of the event, the men's, the women's and both reserves' races were all held on the Tideway on the same day. The women's race saw Cambridge lead from the start, eventually winning by a considerable margin to take the overall record to 43–30 in their favour. In the women's reserve race, Cambridge's Blondie (crew pictured) defeated Oxford's Osiris by nine lengths. The men's reserve race was won by Cambridge's Goldie, who defeated Oxford's Isis by a margin of four lengths. The men's race was the final event of the day and completed a whitewash as Cambridge won, taking the overall record to 83–80 in their favour. The races were watched by around 250,000 spectators live, and broadcast around the world. (Full article...) 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Archive Start a new article Nominate an article Ngũgĩ wa Thiong'o Kenyan writer and activist Ngũgĩ wa Thiong'o (pictured) dies at the age of 87. In sumo, Ōnosato Daiki is promoted to yokozuna. In association football, Liverpool win the Premier League title. In motor racing, Álex Palou wins the Indianapolis 500. In basketball, the EuroLeague concludes with Fenerbahçe winning the Final Four Playoff. Ongoing: Gaza war M23 campaign Russian invasion of Ukraine timeline Sudanese civil war timeline Recent deaths: Harrison Ruffin Tyler Phil Robertson Mary K. Gaillard Peter David Alan Yentob Gerry Connolly Nominate an article May 31: Dragon Boat Festival in China and Taiwan (2025); World No Tobacco Day Bessarion 455 – Petronius Maximus, the ruler of the Western Roman Empire, was stoned to death by a mob as he fled Rome ahead of the arrival of a Vandal force that sacked the city. 1223 – Mongol invasion of Kievan Rus': Mongol forces defeated a Kievan Rus' army at the Battle of the Kalka River in present-day Ukraine. 1468 – Cardinal Bessarion (pictured) announced his donation of 746 Greek and Latin codices to the Republic of Venice, forming the Biblioteca Marciana. 1935 – A magnitude-7.7 earthquake struck Balochistan in British India, now part of Pakistan, killing between 30,000 and 60,000 people. 2013 – A tornado struck Central Oklahoma, killing eight people and injuring more than 150 others. Albertino Mussato (d. 1329)Joseph Grimaldi (d. 1837)Dina Boluarte (b. 1962)Mbaye Diagne (d. 1994) More anniversaries: May 30 May 31 June 1 Archive By email List of days of the year About Cucumis metuliferus, the African horned cucumber, is an annual vine in the cucumber and melon family, Cucurbitaceae. Its fruit has horn-like spines, hence the name "horned melon". The ripe fruit has orange skin and lime-green, jelly-like flesh. It is native to Southern Africa, where it is a traditional food. Along with the gemsbok cucumber and the citron melon, it is one of the few sources of water during the dry season in the Kalahari Desert. This photograph, which was focus-stacked from 25 separate images, shows two C. metuliferus fruits, one whole and the other in cross-section. Photograph credit: Ivar Leidus Recently featured: Ignace Tonené Australian white ibis Hell Gate Bridge Archive More featured pictures Community 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 thesaurus This Wikipedia is written in English. Many other Wikipedias are available; some of the largest are listed below. 1,000,000+ articles العربية Deutsch Español فارسی Français Italiano Nederlands 日本語 Polski Português Русский Svenska Українська Tiếng Việt 中文 250,000+ articles Bahasa Indonesia Bahasa Melayu Bân-lâm-gú Български Català Čeština Dansk Eesti Ελληνικά Esperanto Euskara עברית Հայերեն Magyar Norsk bokmål Română Simple English Slovenčina Srpski Srpskohrvatski Suomi Türkçe Oʻzbekcha 50,000+ articles Asturianu Azərbaycanca □□□□□ Bosanski كوردی Frysk Gaeilge Gale Hrvatski ქართული Kurdî Latviešu Lietuvių □□□□□□ Македонски □□□□□□□□□□ Norsk nynorsk □□□□□□ Shqip Slovenščina □□□ □□□□□□ اردو Retrieved from " 2 This article is about the year 455. For other uses, see 455 (disambiguation). This article needs additional citations for verification. Please help improve this article by adding citations to reliable sources Unsourced material may be challenged and removed.Find sources: "455" – news · newspapers · books · scholar · JSTOR (April 2019) (Learn how and when to remove this message) Calendar year Years Millennium 1st millennium Centuries 4th century 5th century 6th century Decades 430s 440s 450s 460s 470s Years 452 453 454 455 456 457 458 vte 455 by topic Leaders Political entities State leaders Religious leaders Categories Births Deaths Disestablishments vte 455 in various calendarsGregorian calendar455CDLVAb urbe condita1208Assyrian calendar5205Balinese saka calendar376–377Bengali calendar−139 – −138Berber calendar1405Buddhist calendar999Burmese calendar−183Byzantine calendar5963–5964Chinese calendar甲午年 (Wood Horse)3152 or 2945 — to —乙未年 (Wood Goat)3153 or 2946Coptic calendar171–172Discordian calendar1621Ethiopian calendar447–448Hebrew calendar4215–4216Hindu calendars - Vikram Samvat511–512 - Shaka Samvat376–377 - Kali Yuga3555–3556Holocene calendar10455Iranian calendar167 BP – 166 BPIslamic calendar172 BH – 171 BHJavanese calendar340–341Julian calendar455CDLVKorean calendar2788Minguo calendar1457 before ROC民前1457年Nanakshahi calendar−1013Seleucid era766/767 AGThai solar calendar997–998Tibetan calendar阳木马年(male Wood-Horse)581 or 200 or −572 — to —阴木羊年(female Wood-Goat)582 or 201 or −571 King Genseric sacks Rome (455) Year 455 (CDLV) was a common year starting on Saturday of the Julian calendar. At the time, it was known as the Year of the Consulship of Valentinianus and Anthemius (or, less frequently, year 1208 Ab urbe condita). The denomination 455 for this year has been used since the early medieval period, when the Anno Domini calendar era became the prevalent method in Europe for naming years. March 16 – Emperor Valentinian III, age 35, is assassinated by two Hunnic retainers of the late Flavius Aetius, while training with the bow on the Campus Martius (Rome), ending the Theodosian dynasty. His primicerius sacri cubiculi, Heraclius, is also murdered. March 17 – Petronius Maximus, former domesticus ("elite bodyguard") of Aetius, becomes (with support of the Roman Senate) emperor of the Western Roman Empire. He secures the throne by bribing officials of the imperial palace. Maximus consolidates his power by a forced marriage with Licinia Eudoxia, widow of Valentinian III. Maximus appoints Avitus, most trusted general, to the rank of magister militum and sends him on an embassy to Toulouse, to gain the support of the Visigoths. He elevates his son Palladius to Caesar and has him marry Eudocia, eldest daughter of Valentinian III. May 31 – Maximus is stoned to death by an angry mob while fleeing Rome. A widespread panic occurs when many citizens hear the news that the Vandals are plundering the Italian mainland. June 2 – Sack of Rome: King Genseric leads the Vandals into Rome, after he has promised Pope Leo I not to burn and plunder the city. Genseric sacks the city for a period of two weeks. Eudoxia and her daughters, Eudocia and Placidia, are taken hostage. The loot is sent to the harbour of Ostia and loaded into ships, from whence the Vandals depart and return to Carthage. July 9 – Avitus is proclaimed Roman emperor at Toulouse, and later recognised by the Gallic chiefs in Viernum (near Arles). September 21 – Avitus enters Rome with a Gallic army. He restores the imperial authority in Noricum (modern Austria) and leaves a Gothic force under Remistus, Visigoth general (magister militum), at Ravenna. The Ostrogoths conquer Pannonia and Dalmatia. Battle of Aylesford: Prince Vortimer rebels against the pro-Anglo-Saxon policies of his father, Vortigern. He is defeated in the battle at Aylesford (Kent). Hengist and his son Oisc become king of Kent. Horsa and Catigern, brother of Vortimer, are killed. The Britons withdraw to London (according to the Anglo-Saxon Chronicle). Skandagupta succeeds Kumaragupta I as ruler of the Gupta Empire (India). During his reign he crushes the Hun invasion; however, the expense of the wars drains the empire's resources and contributes to its decline. Gaero becomes king of the Korean kingdom of Baekje.[1] Earliest recorded date at Chichen Itza on the Yucatán Peninsula (Mexico) (approximate date). Barter economy replaces organized trade as Romans and other citizens desert their towns for the countryside, where they will be less vulnerable to barbarian raids (approximate date). The city of Vindobona (Vienna) is struck by an epidemic that spreads through the Roman provinces. The disease is probably streptococcus or a form of scarlet fever with streptococcus pneumoniae (approximate date). Rusticus, archbishop of Lyon (approximate date) Wang Baoming, empress of the Southern Qi (d. 512) March 16 Valentinian III, emperor of the Western Roman Empire (b. 419) Heraclius, Roman courtier (primicerius sacri cubiculi) May 31 – Petronius Maximus, emperor of the Western Roman Empire Biyu of Baekje, king of Baekje[1] Catigern, prince and son of Vortigern (approximate date) Horsa, leader of the Anglo-Saxons (approximate date) Kumaragupta I, ruler of the Gupta Empire (India) Niall Noigiallach, High King of Ireland (approximate date) Palladius, son of Petronius Maximus (approximate date) Prosper of Aquitaine, disciple and Christian writer (approximate date) ^ a b "List of Rulers of Korea". www.metmuseum.org. Retrieved April 20, 2019. Retrieved from " 3One hundred years, from 301 to 400 Millennia 1st millennium Centuries 3rd century 4th century 5th century Timelines 3rd century 4th century 5th century State leaders 3rd century 4th century 5th century Decades 300s 310s 320s 330s 340s 350s 360s 370s 380s 390s Categories: Births – Deaths Establishments – Disestablishments vte Eastern Hemisphere at the beginning of the 4th century CE. Eastern Hemisphere at the end of the 4th century CE. The 4th century was the time period from 301 CE (represented by the Roman numerals CCCI) to 400 CE (CD) in accordance with the Julian calendar. In the West, the early part of the century was shaped by Constantine the Great, who became the first Roman emperor to adopt Christianity. Gaining sole reign of the empire, he is also noted for re-establishing a single imperial capital, choosing the site of ancient Byzantium in 330 (over the current capitals, which had effectively been changed by Diocletian's reforms to Milan in the West, and Nicomedeia in the East) to build the city soon called Nova Roma (New Rome); it was later renamed Constantinople in his honor. The last emperor to control both the eastern and western halves of the empire was Theodosius I. As the century progressed after his death, it became increasingly apparent that the empire had changed in many ways since the time of Augustus. The two-emperor system originally established by Diocletian in the previous century fell into regular practice, and the east continued to grow in importance as a centre of trade and imperial power, while Rome itself diminished greatly in importance due to its location far from potential trouble spots, like Central Europe and the East. Late in the century Christianity became the official state religion, and the empire's old pagan culture began to disappear.[citation needed] General prosperity was felt throughout this period, but recurring invasions by Germanic tribes plagued the empire from 376[1][2] CE onward. These early invasions marked the beginning of the end for the Western Roman Empire. In China, the Jin dynasty, which had united the nation prior in 280, began rapidly facing trouble by the start of the century due to political infighting, which led to the insurrections of the northern barbarian tribes (starting the Sixteen Kingdoms period), which quickly overwhelmed the empire, forcing the Jin court to retreat and entrench itself in the south past the Yangtze river, starting what is known as the Eastern Jin dynasty around 317. Towards the end of the century, Emperor of the Former Qin, Fu Jiān, united the north under his banner, and planned to conquer the Jin dynasty in the south, so as to finally reunite the land, but was decisively defeated at the Battle of Fei River in 383, causing massive unrest and civil war in his empire, thereby leading to the fall of the Former Qin, and the continued existence of the Eastern Jin dynasty. According to archaeologists, sufficient archaeological evidence correlates of state-level societies coalesced in the 4th century to show the existence in Korea of the Three Kingdoms (300/400–668 CE) of Baekje, Goguryeo, and Silla. Historians of the Roman Empire refer to the "Long Fourth Century" to the period spanning the fourth century proper but starting earlier with the accession of the Emperor Diocletian in 284 and ending later with the death of Honorius in 423 or of Theodosius II in 450.[3] See also: Christianity in the 4th century Gregory the Illuminator mosaic, converted Armenia from Zoroastrianism to Christianity Contemporary bronze head of Constantine I (r. 306–337 AD) Early 4th century – Former audience hall now known as the Basilica, Trier, Germany, is built. Early 4th century – The Gupta Empire is established. 301: Armenia first to adopt Christianity as state religion. 304–439: The Sixteen Kingdoms in China begins. 306–337: Constantine the Great, ends persecution of Christians in the Roman Empire (see also Constantinian shift) and Constantinople becomes new seat of government (New Rome). Tikal had a population of about 100,000 when it was conquered by Teotihuacan, less than a fourth of its peak population[4] 320: Butuan Boat One, the oldest known Balangay, a multi-purpose ship native to the Philippines is built. 325–328: The Kingdom of Aksum adopts Christianity. 325: Constantine the Great calls the First Council of Nicaea to pacify Christianity in the grip of the Arian controversy. 335–380: Samudragupta expands the Gupta Empire. 337: Constantine the Great is baptized a Christian on his death bed. 350: About this time the Kingdom of Aksum conquers the Kingdom of Kush. 350–400: At some time during this period, the Huns began to attack the Sassanid Empire.[2] 350: The Kutai Martadipura kingdom in eastern Borneo produced the earliest known stone inscriptions in Indonesia known as the Mulavarman inscription written in the Sanskrit language using Pallava scripture.[5] Mid-4th century – Dish, from Mildenhall, England, is made. It is now kept at the British Museum, London. Mid-4th century – Wang Xizhi makes a portion of a letter from the Feng Ju album. Six Dynasties period. It is now kept at National Palace Museum, Taipei, Taiwan, Republic of China. 365: An earthquake with a magnitude of at least eight strikes the Eastern Mediterranean. The following tsunami causes widespread destruction in Crete, Greece, Libya, Egypt, Cyprus, and Sicily. 376: Visigoths appear on the Danube and are allowed entry into the Roman Empire in their flight from the Huns. 378: Battle of Adrianople: Roman army is defeated by the Visigoth cavalry. Emperor Valens is killed. 378–395: Theodosius I, Roman emperor, bans pagan worship, Christianity is made the official religion of the Empire. 378: Siyaj K'ak' conquers Waka on (January 8), Tikal (January 16) and Uaxactun.Wall painting of the Council of Constantinople (381) in the Stavropoleos monastery, Romania 381: First Council of Constantinople reaffirms the Christian doctrine of the Trinity by adding to the creed of Nicaea. 383: Battle of Fei River in China. 395: The Battle of Canhe Slope occurs. 395: Roman emperor Theodosius I dies, causing the Roman Empire to split permanently. Late 4th century: Cubiculum of Leonis, Catacomb of Commodilla, near Rome, is made. Late 4th century: Atrium added in the Old St. Peter's Basilica, Rome. For a more comprehensive list, see Timeline of historic inventions § 4th century. The Stirrup was invented in China, no later than 322.[6][1] Kama Sutra, dated between c. 400 BC to c. 300 AD.[7][8] Iron pillar of Delhi, India is the world's first Iron Pillar.[citation needed] Trigonometric functions: The trigonometric functions sine and versine originated in Indian astronomy.[9] Codex Sinaiticus and the Codex Vaticanus Graecus 1209, are the earliest Christian bibles.[10][11] Book of Steps, Syriac religious discourses.[citation needed] ^ a b "The invention and influences of stirrup". Archived from the original on December 3, 2008. ^ a b Roberts, J: "History of the World". Penguin, 1994. ^ The Long Fourth Century 284–450: Continuity and Change in the Later Roman Empire ed. S. McGill, C. Sogno and E. Watts (Cambridge 2008). ^ "The Maya: Glory and Ruin". National Geographic Magazine. Archived from the original on April 9, 2008. ^ "The Austronesians: Historical and Comparative Perspectives". ANU Press. Archived from the original on 2013-12-25. 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Retrieved 16 March 2013. Retrieved from " 4 The following pages link to 4th century External tools (link count transclusion count sorted list) · See help page for transcluding these entries Showing 50 items. View (previous 50 | next 50) (20 | 50 | 100 | 250 | 500)List of decades, centuries, and millennia (links | edit) Religion in pre-Islamic Arabia (links | edit) Rosetta Stone (links | edit) 20th century (links | edit) 15th century (links | edit) 16th century (links | edit) 17th century (links | edit) 18th century (links | edit) 14th century (links | edit) 1st century (links | edit) 13th century (links | edit) 397 (links | edit) 12th century (links | edit) 11th century (links | edit) 7th century (links | edit) 10th century (links | edit) 9th century (links | edit) 8th century (links | edit) 6th century (links | edit) 5th century (links | edit) 3rd century (links | edit) 2nd century (links | edit) 405 (links | edit) 4th century BC (links | edit) 432 (links | edit) 200s (decade) (links | edit) 300s (decade) (links | edit) 1st century BC (links | edit) 2nd century BC (links | edit) 3rd century BC (links | edit) 5th century BC (links | edit) 6th century BC (links | edit) 400s (decade) (links | edit) 310s (links | edit) 320s (links | edit) 321 (links | edit) 21st century BC (links | edit) 11th century BC (links | edit) 286 (links | edit) 476 (links | edit) 385 (links | edit) 7th century BC (links | edit) 410 (links | edit) 325 (links | edit) 380s (links | edit) 381 (links | edit) 470s (links | edit) 430s (links | edit) 430 (links | edit) 510s (links | edit) View (previous 50 | next 50) (20 | 50 | 100 | 250 | 500) Retrieved from " WhatLinksHere/4th_century" home / geometry / line / parallel linesParallel lines are lines in the same plane that do not intersect. Line segments and rays that are parts of parallel lines are also parallel. What are parallel lines Parallel lines are coplanar lines that are equidistant from each other throughout their entire lengths. Parallel lines never intersect. Some real life examples of parallel lines are railroad tracks. For the railroad tracks to work properly and allow a train to move across them, they cannot ever intersect. Parallel lines symbol The symbol to show parallel lines is "//". In the figure below, m//n. You can also place arrows on the lines, as in the figure above, to show that they are parallel. Transversals of parallel lines When 2 lines are cut (intersected) by a third line, called a transversal, 8 angles are formed. The following terms are used to refer to the angle pairs formed by a transversal and a pair of parallel lines. Corresponding angles - angles that occupy the same relative position when a transversal cuts 2 parallel lines. ∠1 & ∠5, ∠2 & ∠6, ∠3 & ∠7, ∠4 & ∠8 are corresponding angles. Supplementary angles - either of 2 angles whose sum is 180°. ∠2 & ∠3, ∠6 & ∠7, ∠1 & ∠4, ∠5 & ∠8 are supplementary angles. Alternate interior angles - angles formed on the inside of two parallel lines cut by a transversal. ∠3, ∠4, ∠5, ∠6 are alternate interior angles. Alternate exterior angles - angles formed on the outside of two parallel lines cut by a transversal. ∠1, ∠2, ∠7, ∠8 are alternate exterior angles. Consecutive interior angles - angles formed on the inside of the transversal that are supplementary; also referred to as co-interior angles. ∠3 & ∠6, ∠4 & ∠5 are pairs of consecutive interior angles. Vertical angles - pairs of congruent angles formed by the intersection of two straight lines. ∠1 & ∠3, ∠2 & ∠4, ∠5 & ∠7, ∠6 & ∠8 are vertical angles. Properties of angle pairs Several relationships exist among these angles. Referencing the above figure: Alternate exterior angles are congruent, so ∠1≅∠7 and ∠2≅∠8. Alternate interior angles are congruent, so ∠3≅∠5 and ∠4≅∠6. Corresponding angles on the same side of the transversal are congruent, so ∠1≅∠5, ∠2≅∠6, ∠3≅∠7, and ∠4≅∠8. Consecutive interior angles are supplementary, so ∠3 + ∠6 = 180° and ∠4 + ∠5 = 180°. Exterior angles on the same side of the transversal are supplementary, so ∠1 + ∠8 = 180° and ∠2 + ∠7 = 180° In summary, ∠1, ∠3, ∠5, ∠7 are congruent and ∠2, ∠4, ∠6, ∠8 are also congruent. ∠1, ∠3, ∠5, ∠7 are supplementary to ∠2, ∠4, ∠6, ∠8, respectively. Also, if any of the eight angles formed by two parallel lines and a transversal is a right angle, all the angles formed are right angles and the transversal is perpendicular to the two parallel lines. How do you know if two lines are parallel Below are some of the key properties of parallel lines that can be used to determine if two lines are parallel. Parallel lines are always equidistant from each other. Parallel lines never intersect at any point along their lengths. The slopes of two parallel lines are always equal. If two lines are parallel to the same line, they are parallel to each other. Parallel lines cut by a transversal have the following properties: Corresponding angles are congruent. Alternate interior angles are congruent. Alternate exterior angles are congruent. Consecutive interior angles on the same side of the transversal are supplementary. Slope of parallel lines In coordinate geometry, parallel lines have the same slope. The converse is also true; if two lines have the same slope, the two lines are parallel unless they overlap. The blue line below is the graph of the equation y = 2x + 3 and the black line is y = 2x - 4. The slope for both lines is, m = 2. Two vertical lines are still parallel even though their slopes are undefined. Knowing that two lines are parallel is useful for finding the equation of a line even when given little information about it. Example: Suppose a line contains the point (5, -2) and is parallel to the line that has an equation of y = 2x + 6. The slope of the given line is 2. Using the point-slope formula, we have, y - (-2) = 2(x - 5) y = 2x - 12 Parallel lines equations The equation of a parallel line can be written in various forms, such as slope-intercept form: y = mx + b where m is the slope and b is the y-intercept. Recall that the slopes of two parallel lines are always equal. Thus, if we know the slope of one parallel line, it is possible to write the equations for an infinite number of lines parallel to it. For example, given the line y = 2x + 5, we know that any line with a slope of 2, that does not have a y-intercept of 5, will be parallel to the given line. Thus, the general equation for a line parallel to y = 2x + 5 is y = 2x + b for all real values of b except 5. We can also find the equation of a line that passes through a given point that is parallel to a given line. Example Find the equation of a line that passes through the point (1, 2) that is parallel to the line y = 2x + 5. We know that the line must have a slope of 2 since all parallel lines have the same slope. Now we just have to find the y-intercept of a line with a slope of 2 that passes through the point (1, 2). To do this, we can simply plug the point into the slope-intercept formula, then solve for b: 2 = 2(1) + b b = 0 Thus, m = 2 and b = 0, meaning that the line passes through the origin and has the equation: y = 2x Parallel and perpendicular lines Parallel and perpendicular lines are often discussed together because they both involve two distinct lines with very specific properties. The table below shows the key differences between perpendicular and parallel lines. Parallel lines Perpendicular lines Never intersect (0° between) Intersect at 90 degree angle Denoted with || Denoted with ⊥ One simple way to visualize parallel lines is to think of the letters Z and N. If we remove the diagonal that forms the letters, we are left with either two parallel horizontal lines or two parallel vertical lines. Similarly, we can think of the letters T and L for perpendicular lines. Imagine extending each stroke of the letters. Doing so forms two perpendicular lines. We included HMH Into Math Grade 8 Answer Key PDF Module 4 Lesson 3 Explore Parallel Lines Cut by a Transversal to make students experts in learning maths. HMH Into Math Grade 8 Module 4 Lesson 3 Answer Key Explore Parallel Lines Cut by a Transversal I Can identify the relationship between angle pairs as either supplementary or congruent. Spark Your Learning A walker sees these logs on a hike and notices that they make several angles. Draw a representation of the logs and compare the lines and the angles in your drawing. How are the angles the same and how are they different? Turn and Talk What pattern do you notice after measuring all the angles? Build Understanding When two lines are cut by a third line, the third line is called a transversal. The intersections of the lines form eight angles, including five special types of angle pairs. When the two lines cut by a transversal are parallel, as shown, the angles in any of the special pairs will be either congruent or supplementary. 1. The term alternate means that two angles are on opposite sides of the transversal. A. Alternate interior angles are angles on opposite sides of the transversal inside the parallel lines. Measure a pair of alternate interior angles with a protractor. Name the angles you found. Are they congruent or supplementary? ______________________ ______________________ B. Alternate exterior angles are angles on opposite sides of the transversal outside the parallel lines. Measure a pair of alternate exterior angles with a protractor. Name the angles you found. Are they congruent or supplementary? ______________________ ______________________ The term same-side means that two angles are on the same side of the transversal. C. Same-side interior angles are on the same side of the transversal and between the parallel lines. Measure a pair of same-side interior angles. Name the angles you found. Are they congruent or supplementary? ______________________ ______________________ D. Same-side exterior angles are on the same side of the transversal but outside the parallel lines. Measure a pair of same-side exterior angles. Name the angles you found. Are they congruent or supplementary? ______________________ ______________________ E. Corresponding angles are angles in the same position formed when a third line intersects two parallel lines. Measure two pairs of corresponding angles. Name the angles you found. Are they congruent or supplementary? ______________________ ______________________ 4. You can use what you know about the angles formed by parallel lines and a transversal to prove the Triangle Sum Theorem. For any triangle, draw a line through a vertex parallel to the opposite side (in this case, through the vertex of ∠4). A. What is the sum of the measures of Angle 1, Angle 2, and Angle 4? How do you know? ________________ B. How would you classify the angle pairs ∠1 and ∠3, and ∠2 and ∠5? ________________ C. What does that tell you about their respective angle measures? ________________ D. Complete this statement: If m∠1 = m∠3 and m∠2 = m∠5, then m∠3 + m∠4 + m∠5 = m∠ + m∠4 + m∠ = . E. Make three copies of the triangle and arrange them so the three angles form a line. Use parallel lines and transversals to explain how your figure proves the Triangle Sum Theorem. Check Understanding Problems 1-2 show two parallel lines and a transversal. Find the values of x. Question 1. Answer: x° = 55° (alternate exterior angles are equal) Question 2. Answer: x° + 123.25° = 180° x = 180 – 123.25 x° = 56.75° On Your Own Question 3. The picture shows a bridge between two parallel river banks. What angle does the driver's right turn make with the river after crossing the bridge to continue on Northbridge Road? Answer: The right angle and 68° are consecutive interior angles. 180° – 68° = 112° So, the angle that the driver makes when he turns right is 112° Use the diagram showing two parallel lines and a transversal to answer Problems 4-6. Question 4. Which angle forms a pair of alternate interior angles with ∠ACB? Answer: Question 5. Which angle forms a pair of corresponding angles with the 41° angle? Answer: 2x = 41° (corresponding angle) x = 41/2 x = 20.5° Question 6. Solve for x. Answer: x = 20.5° Question 7. Reason The diagram shows two parallel lines cut by a transversal. Clarissa measured ∠1 and ∠2 with her protractor. She says the angles measure 43° and 142°, respectively. Is she correct? Explain. Answer: 43 + 142 = 185 The sum of two angles will not be equal to 180 degrees. It means Clarissa is not correct. Question 8. In the diagram, two parallel lines are cut by a transversal. Which of the numbered angles measures 152°? Answer: ∠1 + 28 = 180 ∠1 = 180 – 28 ∠1 = 152 Question 9. Reason You're not sure whether a pair of angles formed by two parallel lines and a transversal are same-side exterior angles or alternate exterior angles. Both angles measure 53°. Which of the two types must they be? Explain. Answer: Question 10. Which two angles have the same measure? Answer: ∠1 and ∠3 are the corresponding angles that have the same measure. Question 11. Lines m and n are parallel. Find the following angle pairs in the diagram. If you can't find any, write none. alternate exterior _____ corresponding angles ______ same-side exterior ____ alternate interior _____ same-side interior _____ Answer: alternate exterior: ∠4 and ∠5 corresponding angles ∠3 and ∠5 same-side exterior ∠1 and ∠5 alternate interior ∠3 and ∠4 same-side interiors ∠2 and ∠4 Question 12. Two angles are same-side interior angles. The measures of the angles are represented by the expressions 7x + 18 and 10x + 9. What are the two angle measures? Answer: Given, Two angles are same-side interior angles. The measures of the angles are represented by the expressions 7x + 18 and 10x + 9. Same-side interior angles = 180° (7x + 18) + (10x + 9) = 180 17x + 27 = 180 17x = 180 – 27 17x = 153 x = 153/17 = 9 x = 9 The other angle = 10(9) + 9 = 99 I'm in a Learning Mindset! How can I apply previous understanding of supplementary and vertical angles to find missing angles formed by parallel lines cut by a transversal? Lesson 4.3 More Practice/Homework Explore Parallel Lines Cut by a Transversal Question 1. A room in an attic has a sloping wall that makes an angle of 55° with the floor, which is parallel to the ceiling. What is the measure of an angle that forms a pair of same-side interior angles with that angle? Answer: Given, A room in an attic has a sloping wall that makes an angle of 55° with the floor, which is parallel to the ceiling. 180° – 55° = 125° So, the same side interior angle with 55° is 125° Question 2. Math on the Spot Line n is parallel to Line p. Find the measure of each angle. Answer: ∠1 + 40 = 180 ∠1 = 180 – 40 ∠1 = 140 ∠1 = ∠3 (alternate angle) ∠1 = ∠3 = 140 ∠2 = 40 (alternate angle) ∠1 = ∠7 (corresponding angles) ∠1 = ∠7 = 140 ∠4 = 40 ∠4 = ∠6 (alternate angle) ∠7 = ∠5 = 140 (alternate angle) Question 3. Oak Street runs parallel with Maple Street. The angle between North Main Street and West Oak Street where the turn is shown measures 65. What is the measure of the angle between the roads at the turn shown from South Main Street onto West Maple Street? Explain. Answer: Given, Oak Street runs parallel with Maple Street. The angle between North Main Street and West Oak Street where the turn is shown measures 65°. 180° – 65° = 115° Thus the angle between South Main Street and West Maple Street is 115°. Question 4. same-side interior angles formed have measures of (4x + 3)° and (x + 2)°. A. How are the angles related? ______________________ Answer: If two parallel lines are cut by a transversal, then the two same-side interior angles are equal. B. Write and solve an equation to find the value of x. ______________________ Answer: (4x + 3) + (x + 2) = 180 4x + 3 + x + 2 = 180 5x + 5 = 180 5x = 180 – 5 5x = 175 x = 175/5 x = 35 C. What are the two angle measures? ______________________ Answer: 4x + 3 4(35) + 3 = 143 degrees Question 5. Reason In the diagram, two parallel lines are cut by a transversal, and ∠1 and ∠6 do not form any of the kinds of angle pairs that you have learned. What is a way you can find the measure of ∠6 if you know that the measure of ∠1 is 132°? Explain. Answer: ∠1 = 132 ∠1 and ∠5 are the corresponding angles So, ∠1 = ∠5 = 132° ∠5 and ∠6 form a straight angle. 132 + ∠6 = 180 ∠6 = 180 – 132 ∠6 = 48° Test Prep Question 6. Two parallel lines are cut by a transversal. A pair of same-side interior angles formed have measures of (2x – 11)° and (9x + 6.75)°. What is the measure of the smaller angle? ___________ Answer: 2x – 11 + 9x + 6.75 = 180 11x – 11 + 6.75 = 180 11x – 4.25 = 180 11x = 180 + 4.25 11x = 184.25 x = 184.25/11 x = 16.75 Angle 1: 2x – 11 2(16.75) – 11 33.5 – 11 = 22.5 Angle 2: 9x + 6.75 9(16.75) + 6.75 150.75 + 6.75 = 157.50 Therefore the measure of the smaller angle is 22.5 degrees. Question 7. What are the values of x and y? A. x = 30; y = 76 B. x = 76; y = 48 C. x = 80; y = 54 D. x = 132; y = 48 Answer: 132 + y = 180 y = 180 – 132 y = 48 48 + 56 + x = 180 104 + x = 180 x = 180 – 104 x = 76 Thus option B is the correct answer. Question 8. Two parallel lines are cut by a transversal. What kind of angle pair are Angles 1 and 2? A. alternate interior angles B. alternate exterior angles C. same-side exterior angles D. corresponding angles Answer: C. same-side exterior angles Spiral Review Question 9. If a unit circle with a center at (-3, 4) is reflected across the x-axis, where will the center of the reflected image lie? ________________ Answer: If a unit circle with a center at (-3, 4) is reflected across the x-axis. The reflection across the x-axis is (-3, -4) Question 10. One triangle has angles that measure 45 and 83°. Another triangle has angles that measure 45C and 52°. Are the triangles similar? How do you know? Answer: Given, One triangle has angles that measure 45 and 83°. 45 + 83 + x = 180 128 + x = 180 x = 180 – 128 x = 52 Thus the measure of the third angle is 52° Another triangle has angles that measure 45C and 52°. 45 + 52 + y = 180 y + 97 = 180 y = 180 – 97 y = 83° Hence the two triangles are similar. Question 11. An office manager is planning to set up three computer workstations and a printer in a space that is 22 feet wide. The printer takes up 4 feet. A. Write an equation that you could use to find the width w (in feet) of the space available for each computer work station. ______________________ Answer: Given, An office manager is planning to set up three computer workstations and a printer in a space that is 22 feet wide. The printer takes up 4 feet. w = (22-4)/3 B. What is the width of the space available for each computer work station? ______________________ Answer: w = (22-4)/3 w = 18/3 w = 6 The parallel lines calculator is an online free tool that can calculate the equation of a line parallel to the given equation of a line. It uses the slope of one line and a point to find the equation of a line parallel to the first line. In geometry, you primarily use the equation of a line to find another parallel equation. Many students find difficulty finding a new equation of a line because of their lack of interest in geometry. The distance between two parallel lines calculator can calculate a line's equation and make this subject interesting for you by providing an easy solution. Meanwhile, you can use distance between points calculator for precise and accurate results. Formula used by parallel line equation calculator Two lines with equal distance from each other that lie in the same plane and do not intersect are called parallel lines. The equation of a straight line and the slope of the first line are used to calculate the equation of the second line. Parallel lines formula is different from vertical angles. You can ue use vertical angles theorem calculator for finding angles or two intersecting lines. The equation of a line calculator uses the following formulas to calculate the equation of a parallel line. The equation of straight line in slope-intercept form is given by: $$ y \;=\; mx \;+\; c $$ Where m is the slope of the line. The equation of line in point-slope form with point (xo,yo) is given by: $$ y \;-\; y_o \;=\; m(x \;-\; x_o) $$ The formula of parallel lines distance calculator will find the equation of parallel line to the given equation m=mo. This tool will help you calculate parallel line angle of slope as well. Meanwhile, if you only want to calculate angle of a slope, use slope from two points calculator for more accuracy. Why use the equation of a parallel line calculator? Two lines are said to be parallel if they are in the same plane with equal distance and do not intersect each other. This concept usually tells the relationship between two lines. A piece of profound knowledge is required to understand this concept. Many students feel difficulty in finding the equation of line and this is where a distance between parallel lines calculator becomes handy. While calculating the equation line, you can forget to differentiate between different forms of the equations. We provide equation of a parallel line calculator to evaluate both the slope-intercept and point-intercept forms of the equation so that it can be helpful for you. That's why you need to use parallel angle calculator to solve your queries. Related: Also find area of a rectangle calculator with points to multiply the length times width. Advantages of parallel line slope calculator The linear equation is a tool to solve many problems in mathematics and in our daily lives. The parallel line calculator with steps is made to assist you in solving problems related to geometry. This tool has many beneficial uses. These are: Parallel line equation calculator makes the concept of geometry interesting for you by solving the problem in steps. It explains every step and formula involved so that you can understand calculations and the concept. The equation of a parallel line calculator has some fantastic features like the load examples option. Two parallel lines calculator can save time to find a parallel line through a point calculator, when you first understand the concept and then solve the problem manually. It is a free tool, so you don't need to pay any fee. This tool works specifically for parallel lines. Use angle of depression and elevation calculator to find the angle between the horizontal lines. How to Use a distance between two parallel lines calculator? You can find the distance between two parallel lines calculator step by step by doing: In the first step, you need to enter the slope value in the "Value of m" box. Select the sign from the signature box. Enter the value of c in the "Value of c" box. Now enter the value of a point for which you want to calculate the equation of a parallel line. Click on the calculate button. Once you fill in your values, click on the calculate button. Our distance between parallel lines calculator will instantly show you accurate results along with steps. Frequently Asked Questions Are parallel lines congruent? Yes, parallel lines are always congruent. It is because when two parallel lines are intersected by a transversal line, they form two angles at the points of intersections. These angles are same in measure and oppose each other. Therefore, parallel lines are congruent. Are parallel lines perpendicular? No, parallel lines are not perpendicular. Parallel lines are two lines that are at the same distance from each other and they never intersect each other. Therefore, the parallel lines are not perpendicular. Are parallel lines consistent or inconsistent? Parallel lines are inconsistent and independent. It is because they never intersect each other. If they are consistent, then they will no longer be parallel lines. Is parallel lines distance calculator accurate? Yes, this parallel line slope calculator is accurate. You can use this online parallel lines distance calculator to find equation of a given line. Are parallel lines supplementary angles? When two lines are parallel and cut by a transversal line, then they form two angles at the point of intersection. These angles are supplementary angles because they are at the same side of the transversal. Is parallel lines cut by a transversal? Yes, the parallel lines can be cut by a transversal. Transversal is a line that intersect two lines at some points on them and form two interior angles at these points. These angles are equal in measure. Can I rely on distance between parallel lines calculator? Yes, this online parallel angle calculator provide accurate results. This parallel line solver is tested by experts so, you can rely on this tool. Math tutors / Worksheet / Parallel Lines Cut By A Transversal Worksheet Subjects & Topics: Parallel lines cut by a transversal worksheet is a set of exercises that help to see angle relationships at intersections between a transversal and two parallel lines. This skill is foundational in geometry, thus, Brighterly worksheets have several practices to help students see, classify, and calculate such angles. Parallel lines cut by a transversal worksheet with answers PDF: Examples Brighterly's parallel lines cut by a transversal worksheets show students how to identify parallel lines and transversals and work with their angle pairs. Exercises in the worksheets show the differences between alternate interior/exterior, corresponding, vertical, and supplementary angles. Also, they train the skill of verifying parallelism in lines, encourage using different algebraic methods while seeing them cut by a transversal, and push to work with rational numbers to find missing angle measures. This way, students can develop a more complex geometric understanding and feeling. Parallel lines cut by a transversal worksheet [download for free] Download all Brighterly's parallel lines cut by a transversal worksheets PDF by using the link below. Order of Operations with Exponents Worksheet Worksheet Worksheet More 9th grade worksheets Combine worksheets with parallel lines cut by a transversal practice with other exercises to customize the set of exercises to your needs. Benefits of parallel lines cut by a transversal worksheet PDF Two parallel lines cut by a transversal worksheet with answers PDF – benefit #1: See geometric relationships The worksheets train children to constantly see the relationships between parallel lines, transversals, and angle pairs. This way, they can deepen their understanding of geometry rules. The worksheet exercises encourage independent drawing of parallel lines and applying visual aids, thus contributing to developing spatial reasoning and an ability to visualize geometric relationships. Two parallel lines cut by a transversal worksheet printable – benefit #3: Improve logical reasoning The worksheet exercises help to recognize patterns and build deductive thinking. By identifying angle pairs, students are encouraged to apply both geometric and algebraic skills critically, based on the exact problem they need to solve. Note: The study shows that independent, slow-paced learning is highly effective in mastering complex subjects. The exercises on parallel lines are closely linked to applying Euclid's parallel postulate and basic geometry proofs. By getting to the basics, the worksheet practice shows students how to work with geometry concepts of any complexity and identify different angles, including acute, obtuse, right, adjacent, and congruent ones. Parallel lines with transversal worksheet PDF – benefit #5: See a real-life math application Once combined with drawing, working with parallel lines can enhance design and art skills, especially in the cases of perspective drawing and 3D modeling. Note: Parallel lines can be frequently found in architecture and engineering. Mary Grace Carlos 4 articles Mary Grace Carlos is a highly experienced tutor with 13+ years of teaching background. Over a year ago, she joined the Brighterly math tutoring platform to help kids in grades K to 8 with studies while closely following their learning style. Notice that there are 8 total angles: ∠a, ∠b, ∠c, ∠a, ∠e, ∠f, ∠g, and ∠h.Also notice the angles are either acute (less than 90 degrees) or obtuse (greater than 90 degrees). All of the acute angles will equal the same measure and all of the obtuse angles will equal the same measure:Acute Angles: ∠a, ∠d, ∠e, ∠hObtuse Angles: ∠b, ∠c, ∠f, ∠gWith this fact in mind, we can make conclusions such as:Additionally, since relationship between any acute angle and any obtuse angle formed by parallel lines cut by a transversal is supplementary, we can say that the sum of any acute angle and any obtuse angle will be equal to 180 degrees. For example:∠a + ∠b = 180∠f + ∠h = 180∠c + ∠e = 180Note that these relationships will always apply whenever you have two or more parallel lines cut by a transversal. In fact, even if the transversal is perpendicular, the relationships will stay the same (although there will be no acute or obtuse angles since every angle will measure 90 degrees.)For example, take a look at the diagram in Figure 02 below, which features a pair of parallel lines cut by a transversal with the angle measures labeled.