

Solutions to GCSE MATHEMATICS - Test paper 0001

1. Using indices rules we multiply 3 by 4, giving us $a^{3 \times 4} = a^{12}$
2. $8 \times 10^{-3} \times 300 = 2.4$
3. a) 4 sig. figs. = first 4 non-zero digits.
The 5th digit is 5 or above (7), so it will change the 5 to a 6.
Ans = 43.46 (4 s.f.)
b) Either 40 or 50?
The 3 in the units < 5 so it will not change the tens digit to 5. Ans = 40
4. a) Coldest = negative number with largest numerical value.
Ans = St. Petersburg – 10
b) add 4 to – 7 (if needed sketch a number line). $-7 + 4 = -3$
5. common factor of $12a^2$ and $4bc$ is 4, so $4(3a^2 - bc)$
6. a) Write 16 as 2 to the power of a number. $2^4 = 16$. $2^r = 1/2^4$. $2^r = 2^{-4}$
b) ${}^5\sqrt{v} =$ to the power of $\frac{1}{5}$. $3^p = 3^{\frac{1}{5}}$, so $p = \frac{1}{5}$
7. Change mixed number to an improper fraction and then add fractions. $(2 \times 3 + 5)/3 + 5/7 = 11/3 + 5/7 \rightarrow$ fractions with different denominators. Find LCM of 3 and 7 \rightarrow 21, so the new denominator is 21. For the numerator $21/3 \times 11 + 21/7 \times 5 = 77 + 15 = 92$. $92/21$. How many 21s in 92? 4 and $8/21$
- 8.

Event	Probability
Circle and red	cr
Square and red	$(1 - c)r$
Circle and green	$(1 - r)c$
Square and green	$(1 - c)(1 - r)$

9. Direct proportion: $y = kx$

$$m = \sqrt{r}$$

$$5.4 = k\sqrt{1.44}$$

$$k = (5.4) / \sqrt{1.44}$$

$$k = 9/2$$

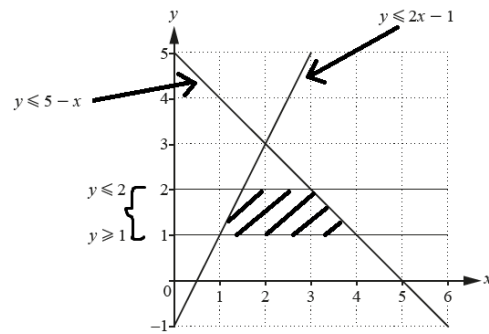
$$m = 9/2 \sqrt{r}$$

$$m = 9/2 \sqrt{2.89}$$

$$m = 7.65$$



10.



11. We need the cube root to solve questions on capacity!

As the barrels are similar, the proportion between their heights and volumes will be in direct proportion.

$$h/\sqrt[3]{50} = 45/\sqrt[3]{80}$$

$$h = (45/\sqrt[3]{50})/\sqrt[3]{80}$$

$$h = 38.4744588$$

$$h = 38.47\text{cm}$$

12. Gradient = $(y_2 - y_1)/(x_2 - x_1)$

Substitute x and y values from points A and B.

$$A(x, 8) \quad B(k, 23)$$

$$5 = (y_2 - y_1)/(x_2 - x_1) = (23 - 8)/(k - x)$$

$$5 = 15 / k - x$$

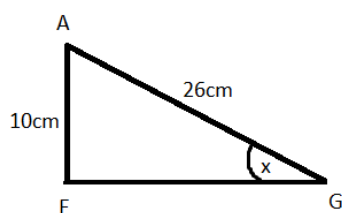
$$5(k - x) = 15$$

$$k - x = 3$$

$$-x = 3 - k \quad (x-1 \text{ to switch signs})$$

$$x = k - 3$$

13. Draw triangle!



SOHCAHTOA → Use $\sin(x) = \text{opposite}/\text{hypotenuse}$

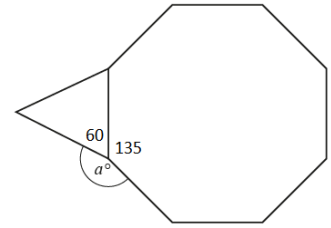
$$\sin(x) = 10/26$$

$$x = \sin^{-1} 10/26$$

$$x = 22.61986495$$

$$x = 22.62^\circ \quad (2 \text{ d.p.})$$

14. Sum of interior angles of polygons = (No. sides – 2) x 180
 Equilateral triangle = all 3 sides same length and all 3 angles same size
 Sum of angles in triangle = 180°
 Angles in equilateral triangle = 60° each
 Full turn (circle) = 360°



Sum of interior angles of octagon = (8-2) x 180 = 6 x 180 = 1080°

Regular octagon = all 8 sides same length and all 8 angles same size

$$1080 / 8 = 135^\circ$$

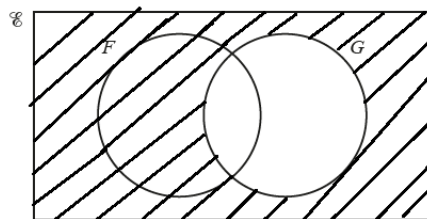
$$x = 360 - 135 - 60$$

$$x = 165^\circ$$

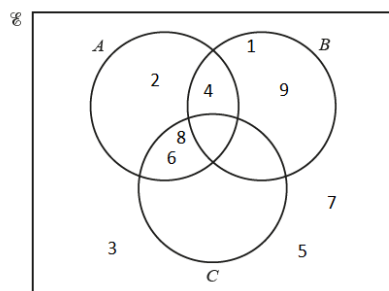
15. a) Speed/time = 8/10 = 0.8 m/s²
 b) total distance = area
 composite shape made of 2 triangles and 1 rectangle
 1) A of triangle 1 = $\frac{1}{2} \times 10 \times 8$
 2) A of triangle 2 = $\frac{1}{2} \times 15 \times 2$
 3) A of rectangle = (50 – 10) x 6
 1) + 2) + 3) = 40 + 15 + 240 = 295m

16. a) plot the points - along 6.5 on the x-axis and 35 up on the y-axis
 b) x and y are both increasing with respect to each other so it's a positive correlation
 c) draw "line of best fit" through the graph so that there is an equal number of points on each side of the line. N.B. It does not need to start from the origin.
 d) draw a dotted line from 7.5 on the x-axis vertically until the line of best fit and trace that point horizontally to the y-axis value. In this case the score is 43.

17. a) "F union with everything else apart from G"



b) i)



ii) Anything that 1) isn't an even number; 2) is a square number; 3) is a multiple of 3

Ans = 9

18. Mark on diagram that PC is also p as $OP = PC$ and that $MG = 2m$

a) vector HF + vector FE = $2m + b$

b) m along and $2p$ up leads us to point D

c) "3 m along and 1 p down"

vector CF and PG

19. We need 1) the Sin rule 2) Formula for area of circle 3) Formula for area of triangle

Joint W to Y to make 2 triangles: ZWY and XWY

Sum of angles in rhombus = 360

$[360 - (2 \times 40)]/2 = 70^\circ$ (angles ZWX and ZYX)

$(\sin 70)/10 = (\sin 40)/WY$

$WY = 6.84\text{cm}$

Height of triangle = $\sqrt{10^2 + (6.84/2)^2} = 9.4\text{ cm}$

Area of sector = $40/360 \times \pi \times 10^2 = 34.91\text{cm}^2$

Area of triangle = $\frac{1}{2} \times 6.84 \times 9.4 = 32.15\text{cm}^2$

Shaded area = (Area of sector – Area of triangle) $\times 2$

Shaded area = $2.76 \times 2 = 5.52\text{cm}^2$

20. a)

		Score on first spin				
		1	3	3	4	6
Score on second spin	1	2	4	4	5	7
	3	4	6	6	7	9
	3	4	6	6	7	9
	4	5	7	7	8	10
	6	7	9	9	10	12

b) the score that occurs the least often = 2

c) there are 7 numbers that are less than 6 and a total of 25 possibilities

$7/25 = 28\%$

d) there is no total of zero in the table so = 0



21. a) sum of angles in triangle = 180°

$$\angle EXG = 180 - 35 - 35 = 110^\circ$$

$$\angle GEH = \angle GFH \text{ as } EG \parallel FH$$

$$\text{Z angles rule: } \angle EGF = \angle GFH = 35^\circ$$

$$a = 110^\circ$$

$$b = 35^\circ$$

b) Minor sector $\angle AOB = 360 - 220 = 150^\circ$

$$\angle AOB = 2 \angle ACB$$

$$150 = 2x$$

$$x = 75^\circ$$

22. a) Quadratic rule needed: $a^2 - b^2 = (a - b)(a + b)$

$$\frac{x(x-3)}{x^2-3^2} = \frac{\cancel{x(x-3)}}{\cancel{(x-3)}(x+3)}$$

$$\text{Ans} = \frac{x}{x+3}$$

$$\begin{aligned} \text{b)} &= \frac{3(2x+5) + 2(x-4)}{(x-4)(2x+5)} \\ &= \frac{6x+15+2x-8}{2x^2+5x-8x-20} \\ &= \frac{8x+7}{2x^2-3x-20} \end{aligned}$$

