S3 Maths Practice Paper: percentages and interest, similar figures, map scale and proportion, volume and surface area of solids, coordinates and straight lines, statistics and probability (100 marks)

Level: S3 | Subject: Maths | 75 minutes | 100 marks | 24 questions | answer key

Section A - Percentages and Interest (18 marks)

Answer all questions and show your working. (Round money answers to the nearest dollar or 2 decimal places.)

#	Question	Answer	Marks
1	A jacket is marked at $480. Its price is first reduced by 15%, then the reduced price is increased by 10%. Find (a) the final selling price; (b) the percentage change of the final price relative to the marked price.	(a) 480 x 0.85 = $408; 408 x 1.10 = $448.8; (b) (448.8 - 480)/480 x 100% = -6.5%, i.e. 6.5% below the marked price	5
2	A principal of $24,000 is deposited at 4% per annum simple interest for 3 years. Find (a) the interest earned; (b) the amount; (c) the amount if the interest were compounded yearly at the same rate (nearest dollar).	(a) I = 24000 x 0.04 x 3 = $2,880; (b) amount = $26,880; (c) 24000 x 1.04^3 = $26,996.74, i.e. $26,997	5
3	A class has 40 students and 45% of them are boys. Find (a) the number of boys and girls; (b) the percentage of girls in the class after 5 girls leave (correct to 0.1%).	(a) boys = 18, girls = 22; (b) girls = 17 out of 35, 17/35 x 100% = 48.6%	4
4	The cost of an item is $320. The shop marks it up by 40% and then sells it at 20% off the marked price. Find (a) the selling price; (b) the percentage profit on cost.	(a) marked price = $448, selling price = $358.4; (b) profit = $38.4, i.e. 12% on cost	4

Section B - Similar Figures and Proportion (18 marks)

Answer all questions and show your working.

#	Question	Answer	Marks
5	Two similar triangles have corresponding sides in the ratio 3 : 5. The smaller triangle has area 54 cm2 and perimeter 36 cm. Find (a) the area of the larger triangle; (b) its perimeter.	(a) area ratio = 9 : 25, so 54 / 9 x 25 = 150 cm2; (b) perimeter = 36 / 3 x 5 = 60 cm	5
6	Two similar cylinders have radii in the ratio 2 : 3 (and the same ratio of heights). The larger cylinder has volume 405 cm3. Find (a) the volume of the smaller cylinder; (b) the ratio of their curved surface areas.	(a) volume ratio = 8 : 27, so 405 x 8/27 = 120 cm3; (b) curved surface area ratio = 4 : 9	5
7	A map has a scale of 1 : 25,000. Find (a) the actual distance, in km, between two places 6.4 cm apart on the map; (b) the actual area, in km2, of a field shown as 12 cm2 on the map.	(a) 6.4 x 25,000 = 160,000 cm = 1.6 km; (b) 12 x 25,000^2 = 7.5 x 10^9 cm2 = 0.75 km2	4
8	x varies directly as y, and y = 30 when x = 12. Find (a) y when x = 20; (b) if y varies inversely as z and z = 8 when y = 30, find y when z = 15.	(a) k = 30/12 = 2.5, so y = 50 when x = 20; (b) yz = 240, so y = 16 when z = 15	4

Section C - Volume and Surface Area of Solids (16 marks)

Answer all questions and show your working.

#	Question	Answer	Marks
9	A cylinder has radius 7 cm and height 20 cm. Taking pi = 22/7, find (a) its volume; (b) its total surface area.	(a) V = 22/7 x 49 x 20 = 3080 cm3; (b) total surface area = 2 x 154 + 880 = 1188 cm2	4
10	A cone has base radius 6 cm and slant height 10 cm. Taking pi = 3.14, find (a) its height; (b) its volume; (c) its curved surface area.	(a) h = sqrt(100 - 36) = 8 cm; (b) V = 3.14 x 36 x 8 / 3 = 301.44 cm3; (c) curved area = 3.14 x 6 x 10 = 188.4 cm2	4
11	A sphere has radius 3 cm. Taking pi = 3.14, find (a) its volume; (b) its surface area. Give answers to 3 significant figures.	(a) V = 4/3 x 3.14 x 27 = 113 cm3; (b) surface area = 4 x 3.14 x 9 = 113 cm2	4
12	A solid metal sphere of radius 3 cm is melted and recast into small spheres of radius 1.5 cm, with no loss. How many small spheres can be made?	volume ratio = 27 : 3.375 = 8 : 1, so 8 small spheres (113.04 cm3 / 14.13 cm3)	4

Section D - Coordinates and Equations of Straight Lines (16 marks)

Answer all questions and show your working.

#	Question	Answer	Marks
13	Given A(-2, 3) and B(4, -5), find (a) the length of AB; (b) the coordinates of the mid-point of AB.	(a) AB = sqrt(36 + 64) = 10; (b) mid-point = (1, -1)	4
14	Find the equation of the straight line passing through (2, 5) with slope 3, and find its x-intercept.	y - 5 = 3(x - 2), i.e. y = 3x - 1; setting y = 0 gives x = 1/3	4
15	The line L has equation 2x + 3y = 12. Find (a) the slope of L; (b) its y-intercept; (c) whether the point (6, 0) lies on L.	(a) y = -2/3 x + 4, slope = -2/3; (b) y-intercept = 4; (c) 2 x 6 + 0 = 12, so (6, 0) lies on L	4
16	The lines y = 2x + 1 and y = -x + 10 meet at P. Find (a) the coordinates of P; (b) the area of the triangle formed by the two lines and the x-axis.	(a) x = 3, y = 7, so P = (3, 7); (b) base = 10 - (-0.5) = 10.5, area = 0.5 x 10.5 x 7 = 36.75	4

Section E - Statistics (18 marks)

Answer all questions and show your working.

#	Question	Answer	Marks
17	The data are 4, 7, 7, 9, 11, 13, 16. Find (a) the mean (correct to 3 significant figures); (b) the median; (c) the mode; (d) the range.	(a) 67/7 = 9.57; (b) median = 9; (c) mode = 7; (d) range = 12	5
18	The mean mark of 30 students is 62. The 18 boys have mean mark 58. Find the mean mark of the girls.	total = 1860; boys total = 1044; girls 12 score 816 in total, so mean = 68	4
19	The grouped reading times (minutes) of 20 students are: 0 to under 10: 4; 10 to under 20: 7; 20 to under 30: 6; 30 to under 40: 3. Find (a) the modal class; (b) the class containing the median; (c) the estimated mean using class mid-points.	(a) modal class 10 to under 20; (b) the 10.5th value lies in 10 to under 20; (c) (20 + 105 + 150 + 105)/20 = 19 minutes	5

20	Ten numbers have mean 15. A new number 27 is added. Find the mean of the new set (correct to 2 decimal places).	old total = 150; new total = 177; new mean = 177/11 = 16.09	4

Section F - Probability (14 marks)

Answer all questions and show your working or reasoning.

#	Question	Answer	Marks
21	A bag contains 5 red, 3 blue and 2 green balls. One ball is drawn at random. Find (a) P(red); (b) P(not blue); (c) P(green or blue).	10 balls in total. (a) 5/10 = 0.5; (b) 7/10 = 0.7; (c) 5/10 = 0.5	4
22	Two fair dice are thrown together. Find the probability that (a) the sum is 7; (b) the sum is 12.	(a) 6 favourable outcomes, 6/36 = 1/6 = 0.167; (b) only (6,6), 1/36 = 0.028	3
23	In a city the probability of rain on a day is 0.3. If it rains the probability a student is late is 0.4; if it does not rain the probability is 0.1. Find (a) P(rain and late); (b) P(late).	(a) 0.3 x 0.4 = 0.12; (b) 0.12 + 0.7 x 0.1 = 0.19	4
24	Two students are chosen at random from 4 boys and 3 girls. Find the probability that (a) both are girls; (b) at least one is a boy.	(a) 3 good choices out of 21, so 3/21 = 1/7 = 0.143; (b) 1 - 1/7 = 6/7 = 0.857	3