PIE CHARTS

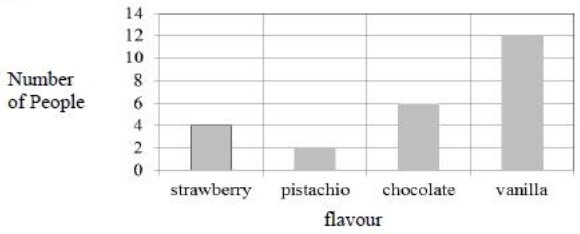
BASIC PIE CHARTS, MIXED-TOPIC PIE CHART QUESTIONS, COMPARATIVE PIE CHARTS

Mark Scheme

Q1.

Question	Scheme	Marks
(a)	(The proportion of losses is) greater for England, o.e. OR $\frac{100}{360} > \frac{80}{360}$	B1 (1)
(b)	$48 \times \frac{210}{360}$ o.e.	M1
	$= 28$ cao	A1 (2)
(c)	The angle/proportion for draws is smaller in the England pie chart (o.e.), so England have played more matches.	B1 depB1 (2) [5]
	Notes	
(a)	Allow any correct comparison of proportion. (Accept e.g. sector/angle/area for 'proportion'.) e.g. The proportion is greater than ¼ for England and less than ¼ for Switzerland. For numerical comparison accept 95~105 and 75~85 or percentages 26~29 and 21~24 Condone: England had more losses, o.e.	
(b)	M1 for any correct equivalent calculation e.g $\frac{48}{360} \times 210$, $48 \div (360/210)$ Calculation may be seen in stages for M1 Final answer 28 scores M1A1	
(c)	1st B1 for comparing angles (or sizes) for draws in the pie charts. Note they could find angle per match: England 7.5°, Switzerland awrt 9° 2nd B1 dependent on 1st B1, for England have played more matches. e.g. 'England, as the same number takes up a smaller portion' scores B1B1 or 'England, as they (also) had more wins **and** losses' scores B1B1	

Q2.

Question	Scheme	Marks
(a)	Vanilla	B1 (1)
(b)	$\frac{2}{12} \times 24 (= 4)$	B1 (1)
(c)		M1 A2 B1 (4) [6]
	Notes	
(b)	Any equivalent calculation (e.g. 2 × 2) which may been seen in stages or identifying 1 'sector' = 2 **and** an answer of 4 seen	
(c)	M1 for any bar drawn to a height of 2, 6 or 12 A2 for all bars drawn to correct height (ignore width and shading of bars) (A1 for one error or omission) B1 for label of flavour/ice cream on *x*-axis and label of number/frequency/people on *y*-axis (but e.g. 'number of ice creams' is B0).	

Q3.

Question	Answer	Additional guidance	Mark
(a)	B1 99		(1)
(b)	B1 Great Britain won (8) more gold medals than Russia	B1 for a correct comparison	(1)
(c)	B1 for e.g. the newspaper might use a pictogram to make it more visually appealing to the target audience	B1 for a correct statement assessing the appropriateness of pictograms considering the target audience	(1)
(d)	M1 $\frac{46}{121} \times 360$ or $\frac{37}{121} \times 360$ or $\frac{38}{121} \times 360$ A1 for angles 137, 110 and 113 correctly drawn B1 for labels or key  	M1 for one correct angle calculation (implied by one sector drawn in tolerance 137, 110 or 113 seen) A1 all sectors correctly drawn B1 for labelling a 3-sector pie chart with gold, silver and bronze, or a correct key	(3)
(e)	M1 $\frac{46}{121}$ or $\frac{27}{67}$ A1 for 0.38 and 0.4 **and** conclusion Sanjit is not correct or 137° and 145° **and** conclusion Sanjit is not correct	M1 for correct interpretation of the data: $\frac{46}{121}$ (× 100) or $\frac{27}{67}$ (× 100) A1 for two figures in comparable form, allow percentages or equivalent fractions or both pie chart angles and the correct comparison and conclusion that the UK had a higher proportion	(2)

Q4.

Question number	Answer	Additional guidance	Mark
(a)	B1 e.g. • Reading and playing computer games is equally popular. • Watching TV was the least popular. • Playing outside was the most popular. • ¼ of primary students like reading the best.	B1 for any correct conclusion based upon the primary school pie chart Condone playing outside on its own	(1)
(b)	B1 for each of two conclusions comparing the primary and secondary students e.g. • Greater proportion of primary students like playing outside. • Playing computer games is equally popular with both groups. • Greater proportion of primary students like reading best. • Greater proportion of secondary students like watching TV best. • Playing outside is the greatest for both	B1 for each of two conclusions comparing the primary school pie chart to the secondary school pie chart Condone 'more' for greater proportion	(2)

Q5.

Question	Answer	Additional guidance	Mark
(a)	B2 Male/Diesel 18, Female/Petrol 32, Total/ Diesel 35	B2 for 3 correct values in table (B1 for 1 or 2 correct values found)	(2)
(b)	M1 $\frac{3}{50} \times 360$ A1 = 21.6 (°)	M1 for correct equivalent calculation A1 accept 21.6, 21 or 22 (without working) SC: If M0A0 scored,B1 for answer 20	(2)

(c)	First conclusion B1 first conclusion not correct B1 …as Diesel is not the largest section of the pie charts/petrol has the largest section of the pie chart/petrol is the most common. Second conclusion B1 second conclusion is supported… B1 …as electric sector is larger in the male pie chart/males have a larger proportion/percentage/angle than females. Reliability B1 e.g. Conclusions reliable due to large sample size. OR Conclusions not reliable as • Sample not random • May not be representative of population/ only done in one car park • Car may be driven by both male and females (one car family)	B1 for rejecting first conclusion B1 for equivalent supporting reason For the first two B marks ignore reference to figures. B1 for accepting second conclusion B1 for equivalent supporting reason For the 4th B mark do not allow reference to figures from the two-way table only. B1 for a comment on reliability supported by appropriate reasoning	(5)

Q6.

Question	Scheme	Marks
(a)	Sleeping	B1 (1)
(b)	¼	B1 (1)
(c)	6 (hours)	B1 (1) [3]
	Notes	
(b)	Allow 0.25 or 25% or equivalent fraction e.g. $\frac{25}{100}$, $\frac{6}{24}$ or $\frac{90}{360}$; But 90° is B0	

Q7.

Question	Scheme	Marks
(a)	Increased (by 78.6 million)	B1 (1)
(b)	Microsoft	B1 (1)
(c)	Android	B1 (1)
(d)	Rounding error	B1 (1)
(e)	One of - **Total sales** are different for the two years, or - To see each OS **in proportion** to total sales	B1 (1)
(f)	$\frac{24.6}{171.6}\times 360$ (= 51.60…) OR $\frac{14.3}{100}\times 360$ (= 51.48) Answer in range 51~52	M1 A1 (2)
(g)	$(r^2 =)\ \frac{250.2}{171.6}\times 5^2$ (= 36.45...) $\therefore r$ (= 6.037...) = 6 (cm)	M1 A1 (2)
		[9]
	Notes	
(a)	Any indication that they went up. Ignore figures. Ignore excess comments if not contradictory. BUT B0 for e.g. '**most** increased' or 'some went up / some went done'	
(d)	Accept any comment referring to rounding.	
(e)	Allow equivalent wording for either statement e.g. 'it will show percentages/market share better'	
(f)	Range 51~52 is inclusive	
(g)	M1 Equivalent attempt to use correct scale factor **for area**. e.g. May see $\frac{250.2}{171.6}\times 78.5...$ May be implied by answer given to **more than 1sf** (ie 6.0 or better) A1 6 or better (e.g. 6.0 or 6.04 etc.) SC: If no working and answer of '6' only score B1.	

Q8.

Question	Answer	Additional guidance	Mark
(a)	B1 More sales (in May 2019 than in May 2015)	B1 Assume comment is about 2019 unless otherwise indicated. Accept equivalent statements. Accept converse if clear reference to correct year is made.	(1)
(b)	M2 $30\times\frac{90}{60}\times\left(\frac{4}{3}\right)^2$ or $30\times 6\times\left(\frac{4}{3}\right)^2\div 4$ OR e.g. M1 $\pi\times 3^2\times\frac{60}{360}=1.5\pi$ (or 4.71) cm^2 represents 30 packs M1 $\pi\times 4^2\times\frac{90}{360}=4\pi$ (or 12.57) $\Rightarrow \frac{4\pi}{1.5\pi}\times 30$ A1 = 80	M2 for a complete method which uses ratio of angles and ratio of radii squared (allow their '3' and '4') (M1 for either ratio of angles $\frac{90}{60}$ or …× 6 … ÷4 or ratio of radii squared $(\frac{4}{3})^2$ implied by 45 or 53.3… or answer of 60 or (total frequency in 2019 =) 320 or $\frac{\sqrt{f_2}}{\sqrt{f_1}}=\frac{4}{3}$ oe) OR M1 for finding relationship between **area** and number of packs. (allow their '3')	(3)
		M1 for complete method using both areas and both angles. (allow their '4') A1 Allow integer answer from their '3' and their '4' from 76 to 84 inclusive	

Q9.

Question number	Answer	Additional guidance	Mark
(a)	B1 the pie charts do not show the number of travellers (they only show the proportion/percentage was greater for Business in January)	Allow an implication that the totals are different.	(1)
(b)	M1 $\frac{1080733}{37} \times 32$ A1 934 688	M1 for any full correct equivalent complete method e.g. $\frac{1080733}{37} = 29209$, $29209 \times = 32$	(2)
(c)	How B1 use of comparative pie charts. B2 The two pie charts have different radii, the radii of the pie charts will be in proportion to the square root of the ratio of the totals. This can be implied for the correct calculations to find the Jan and July radii. In order for the award of both marks, the correct calculations must be seen. OR B1 The two pie charts will have different radii.	B1 - Identifies method – allow this mark if the method is described but they do not explicitly state 'Comparative Pie Chart' Allow for e.g. both pie charts will be of a different size. B2 for a complete description that could be used to draw a new diagram or any relevant calculations For example; Any of the following calculations; • the radius of the July pie chart will be $\sqrt{\frac{4020}{2931}}\ (1.17) \times$ radius of January pie chart OR • The radius of the January pie chart will be; $\sqrt{\frac{2931}{4020}}\ (0.85) \times$ radius of July pie chart OR • the two radii are in proportion such that $R^2 : r^2 = 4020 : 2931$ or $r^2 : R^2 = 2931:4020$	(5)

Question number	Answer	Additional guidance	Mark
(c) cont.	**Reasons** B1 because areas/sizes in comparative pie charts are better to compare total frequencies/numbers when totals are different. B1 The proportions (percentages) will be the same	**OR** • If the radius of the January pie chart is (eg) 10 cm, the radius of the July pie chart will be 1.17×10 cm = 11.7 cm. **OR** • If the radius of the July pie chart is (eg) 10 cm, the radius of the January pie chart will be 0.85×10 cm = 8.5 cm. or B1 for stating the radii will be different lengths. B1 for correct explanation as to how the method is appropriate. [Area is proportional to frequency – on two Pie Charts] B1 for understanding the proportions of all the sectors will not change when converting to comparative pie charts from pie charts.	(5)

Q10.

Question	Answer	Additional guidance	Mark
(a)	B1 e.g. 'Valid since the angle of each pie chart for Europe is larger (than the angle North America)' B1 e.g. 'Not valid since the pie charts only show proportions and not numbers'	B1 for correct assessment and supporting reason. Allow 'proportion', 'size', 'slice,' etc. B1 for correct assessment and supporting reason	(2)
(b)	B1 e.g. 'Can compare areas/sizes of comparative pie charts to compare total frequencies/numbers'	B1 for a relevant comment on the appropriateness of comparative pie charts	(1)
(c)	M1 $3\times\sqrt{\frac{3786000}{2599000}}$ A1 3.6	M1 for a correct calculation which may be done in steps A1 for awrt 3.6	(2)

Q11.

Question	Answer	Additional guidance	Mark
(a)	B2 for reference to (most) areas with high numbers of bees corresponding to areas with high concentrations of wild flowers AND reference to the area at the bottom right (A4-A6, B4-B6) having a high concentration of bees, but a low concentration of wild flowers OR if B2 not earned... B1 for reference to (most) areas with high numbers of bees corresponding to areas with high concentrations of wild flowers OR reference to the area at the bottom left (A4-A6, B4-B6) having a high concentration of bees, but a low concentration of wild flowers	B2 for a complete answer assessing the conclusion based on the diagram OR if B2 not earned... B1 for an incomplete answer assessing the conclusion based on the diagram	(2)
(b)	B1 eg when deciding you should consider the total population… B1 ….if the total population is different then you should use comparative pie charts OR …if the total population is the same then you can use pie charts	B1B1 for a complete answer assessing the appropriateness of pie charts and comparative pie charts	(2)
(c)	M1 for $\frac{349}{236}=\frac{r^2}{5^2}$ A1 for 6.08(03…)	M1 for a correct equation connecting the two radii A1 for awrt 6.1	(2)

Q12.

Question number	Answer	Additional guidance	Mark
(a)	B1 can be used to compare relative frequencies (areas) rather than just proportions	B1 for a suitable advantage of using comparative pie charts	(1)
(b)(i) (ii)	B1 2005 sector will have a bigger angle B1 2018 sector will have a bigger area	Allow converse statements	(2)
(c)	M1 $\frac{\sqrt{12.5}}{\sqrt{8.3}}\times 5$ A1 6.1 (cm)	M1 for a correct calculation A1 awrt 6.1	(2)

Q13.

Question number	Answer	Additional guidance	Mark
(a)	B1 Area for 'Very' for Newspapers is less than area for 'Very' in Radio B1dep since $60 < 65$	B1 for correct comparison of areas Accept converse statement. B1dep for correct supporting reason	(2)
(b)	M1 $152\times\left(\frac{4.7}{3}\right)^2 (=373)$ M1 $\frac{65}{373}\times 360$ A1 62.7	M1 attempt at find total frequency for Radio pie chart M1 attempt to find angle for Radio pie chart Allow: $\frac{65}{k}\times 360, \quad k>65$ where k is an integer A1 62.7 – 63.0	(3)